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ABSTRACT

This study examined the role that sex-related differences in the nature of the grade criterion and in variables associated with academic performance play in the over- and under-prediction of college grades by the Scholastic Aptitude Test (SAT) both when the test is used alone and in conjunction with high school grades. An entire freshman class (4,351 students) at a large state university was studied. Women's grade point average (GPA) was underpredicted, but only by a small amount. Adjusting the GPA for differences in grading standards for individual courses did not affect the underprediction, but controlling for sex differences in individual-difference variables concerned with academic preparation, studiousness, and attitudes about mathematics reduced or essentially eliminated the underprediction. Eight figures and 22 tables present results of the analysis. Two appendixes contain classifications and scores, and the study questionnaires. (Author/SLD)

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College Board Report

No. 91-2

Sex Differences in SAT® Predictions of College Grades

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College Entrance Examination Board, New York, 1991

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Foreword

Extensive research over the past several decades has documented and attempted to explain and understand the differences between men and women on a wide range of educational outcomes. Educators and researchers have long been aware that such differences exist but have generally dismissed them as too small to affect policy. And, indeed, much harm has been done and can still be done by exaggerating gender differences. This is an area that is prone to overgeneralization, by both advocates and critics of tests. However, it is important for test developers to evaluate very carefully the fairness of our tests. In addition, studying consistent, though small, gender differences and trends may help us understand behavior in a way that can be used to improve education and policy.

This report deals with sex differences in the ability of admissions credentials (tests and high school record) to predict success in college. It is based on the entire fall 1988 entering class at a major state university. However, to understand the data for a particular university at a particular time, it is useful to review the many changes that have happened in the last 10 to 20 years in the transition from high school to college for men and women.

Twenty years ago, young men were more likely to apply to college, to choose selective and expensive colleges, to be admitted, to receive financial aid, and to persist in college. There were slightly more young men than young women taking the SAT, and young women's verbal test scores were about equal to those of young men. Since then, many of the assumptions almost automatically made about young women and men have changed. On tests given to representative samples of high school students, young women's traditional verbal advantage has disappeared (except perhaps in writing) and young men's traditional mathematical advantage has nearly disappeared. All college-bound students are enrolling in more academic classes in high school, with especially large increases in the mathematics and science courses being taken by young women. At the same time, young women are becoming involved in discipline problems at school at an increasing rate.

Women have become the majority of those who take admissions tests, including the SAT, ACT, and GRE; they have also become the majority of college enrollees, graduates, and graduate school applicants. The population of women taking college admissions tests has changed in composition as it has grown. Women SAT-takers are more likely to lack essential college preparatory courses, to be the first in their family to attend college, to belong to racial or ethnic minorities, and to have lower family incomes. Women are also more likely to enroll in community colleges or colleges near home.

Finally, during the last 20 years, the ability of admissions credentials to predict success in college has declined slightly. The decrease has affected a number of tests as well as high school grades. This trend seems to be due at least in part to increases in the variety of different courses taken by freshmen and to increases in the variability of grading standards from course to course. Interestingly enough, the decline seems to affect the prediction of men's college performance more than that of women.

It is in the context of these many complex changes in young men's and women's lives, expectations, training, and experiences in college that this study must be understood. The most important lesson is that many of our myths and assumptions about gender differences in academic performance have quite recently been proven wrong. For example, recent trends in test scores are strong evidence against genetic or hormonal theories of sex differences in quantitative performance. And a series of studies—called "meta analyses"—over the last decade have reevaluated a large body of earlier research on sex differences. These studies have begun to show the trends and changes mentioned above; they have also discovered that sex/gender differences are more complex than we had supposed. Findings for one age or one ability level do not hold true for all; the performances that do show differences are much more discrete than the original researchers supposed. We now know that much of our "knowledge" about gender differences was exaggerated and overgeneralized.

This report is focused on one of the most baffling aspects of the sex difference research. Women's scores on the SAT and many other tests are often lower than men's, but women tend to receive higher grades in both high school and college. Further confounding this issue is that the SAT and other admissions test scores relate more closely to college grades for women than for men. One of the most widely accepted definitions of an appropriate and fair test is that the test must work equally well for all subgroups of the population. Studies of predictive validity show that the average correlation between admissions test scores and college grades is actually higher for women than men at most colleges. At the same time, however, colleges that use the same formula to predict college grades for men and women will often see slight underprediction for women because of the higher overall grades that women tend to earn. The authors note that this may be related to sex bias in the admissions tests and high school grades, but it may also be due to differences in grading practices or in women's and men's work habits.

A growing body of research suggests that much, if not all, of the over- and underprediction can be accounted for by different grading standards in the courses that women and men typically take. While differential grading standards were not found in this study of first-semester grades at the state university, the authors cite several investigations that show grading standards are a major part of the answer at other institutions. Indeed, women tend to concentrate their studies (in both high school and college, but particularly college) in the arts and humanities, where higher average

grades are the norm. Men, on the other hand, tend to gravitate toward subjects such as math and science that, on the average, seem to have more rigorous grading standards.

The purpose of this study was to look beyond the information included in traditional studies of predictive validity—test scores and high school grades as predictors, and college grade-point average as the criterion of success in college. These usual variables were supplemented by measures of other attitudes and behaviors that could influence either test scores or grades differentially for men and women. Some of these variables may be unrelated to test scores but affect grades (e.g., handwriting), others may be unrelated to grades but affect test scores (e.g., test anxiety), and still others may affect both test scores and grades (e.g., study habits). Furthermore, some of these variables may concern the characteristics of the students at the point they enter college (e.g., text anxiety), whereas others may concern the students' characteristics in college (e.g., attendance, study habits).

This study provides some insight into the reasons women's grades are underpredicted: women differ from men in their academic preparation, in completing their college work, and in their belief in the usefulness of math. Other variables account for the underprediction in more complicated ways. In contrast to other men and women, those with high confidence and aspirations, as well as those who make detailed notes and take tests on time, showed no difference in prediction. The authors speculate that these "interactions" may mean that women who lack confidence in their academic ability compensate by working harder, while men in that situation simply give up. Together, these variables, encompassing academic preparation, confidence, and practical study habits, help explain underprediction because they are linked to grade getting and are not measured well by the SAT or by the high school record.

Perhaps just as important, this study casts doubt on some other possible causes of underprediction. Several variables that conventional wisdom has assumed to be related to underprediction turned out to play no role: locus of control, cutting classes, text anxiety, handwriting, and amount of studying.

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ABSTRACT

This study examined the role that sex-related differences in the nature of the grade criterion and in variables associated with academic performance play in the over- and underprediction of college grades by the SAT when the test is used alone and in combination with high school grades. An entire freshman class at a large state university was studied. Women's GPA was underpredicted but only by a small amount. Adjusting the GPA for differences in grading standards for individual courses did not affect the underprediction, but controlling for sex differences in individual-difference variables concerned with academic preparation, studiousness, and attitudes about mathematics reduced or essentially eliminated it.

INTRODUCTION

It has long been observed that women earn higher college grades than expected on the basis of their scores on ability or achievement tests (e.g., Wagner and Strabel 1935). This phenomenon was originally viewed as "overachievement" (Lavin 1965; Thorndike 1963), and interest was focused on individual-difference variables that might be implicated, such as motivation or work habits. Subsequently, this phenomenon was reconceptualized as "underprediction" (Hunter, Schmidt, and Rauschenberger 1984; Jensen 1980; Linn 1973; Reynolds 1982), and attention shifted to the psychometric characteristics of the tests, especially the instruments' fairness.

Such "differential prediction" (Bartlett and O'Leary 1969) for women and men when the same prediction system (e.g., regression equation) is used for both implies that the predictions of grades by the tests are unfair to women, in that the predicted grades of women are systematically lower than those of men with the same test scores. This widely used definition of unfairness or bias (American Psychological Association, American Educational Research Association, and National Council on Measurement in Education 1985; Cleary et al. 1975; Equal Employment Opportunity Commission et al. 1978; Society for Industrial and Organizational Psychology 1987)—the "regression model" (Cleary 1968; Humphreys 1952; Gordon 1953)—necessarily assumes that the grade criterion is equally fair and unbiased for both sexes.

Several surveys indicate that the extent of this underprediction is very small, though highly consistent, when college admissions tests—Scholastic Aptitude Test (SAT) and American College Testing Program Assessment (ACT)—are used to forecast college grade-point average (GPA) on the standard 1 to 4 scale. The mean over- and underprediction (predicted GPA–actual GPA) of freshman GPA was −.06 for women and .04 for men in 41 colleges and universities when the SAT was used in combination with high school average or rank (Clark and Grandy 1984). The corresponding means in 19 institutions were −.12 for women and .07 for men when the ACT and high school grades were used to predict freshman GPA, and −.17 and .10 when only the ACT was used (American College Testing Program 1973). And the median over- and underprediction was −.05 for women and .05 for men in 170 to 172 schools when the ACT and high school grades were used to predict freshman GPA (Sawyer 1986).

Although the average amount of over- and underprediction is small, one study suggests that it may be substantial for high scorers on the admissions tests. Women and men in the Rutgers College freshman class who were in the top 10 percent of their respective SAT distributions (total SAT scores of 1230 for women and 1280 for men) had a mean difference of .26 (favoring women) in their freshman GPA whereas the corresponding difference was only .10 for the entire class (Kanarek 1988).

Whether the grade criterion is equally fair and unbiased for women and men, as the regression model assumes, has been extensively investigated. It is obvious that underprediction for women could arise if they took more leniently graded courses than men did (Hewitt and Goldman 1975). Indeed, studies that control for differences in grading standards have generally found less underprediction for women. A study of individual course grades at San Diego State University found no significant sex differences in over- and underprediction by the SAT and high school GPA (McCornack and McLeod 1988).

Three investigations controlled for differences in academic programs. Sex differences in over- and underprediction were decreased when the SAT and high school grades were used to predict freshman GPA for students in specific curricular areas (e.g., engineering, business) in 12 institutions (Clark and Grandy 1984). The mean over- and underprediction was −.03 for women and .02 for men (compared to −.05 for women and .04 for men in entire freshman classes). Sex differences in over- and underprediction of GPA by the SAT at four University of California campuses were reduced by about two-thirds, on the average, when college major was controlled (Hewitt and Goldman 1975).[1] And sex differences in over- and underprediction of two-year GPA by the ACT occurred at the University of Iowa for students with business, liberal arts, and undecided majors but not for premedicine students (Gamache and Novick 1985).

Two other studies adjusted four-year GPA for course differences. Sex differences in over- and underprediction by the SAT, Achievement Tests, and high school rank (HSR) completely disappeared at Dartmouth College when GPA was adjusted for course-by-course differences in grading standards (Elliott and Strenta 1988). And sex differences in over- and underprediction by the SAT and high school GPA

1. GPA was not based on the same length of time for all students but apparently varied from approximately one year to four years.

were not significant at Stanford University when GPA was based on course grades equated by item-response theory methods (Young 1991).

Other kinds of explanations for this phenomenon exist, mirroring the differing emphases of the over- and underachievement and over- and underprediction conceptualizations. One explanation concerns sex differences, and the same broad set of variables that has been invoked to account for sex differences in cognitive functioning applies (Feingold 1988): childhood training and experience, attitudes, parental and teacher expectations and behaviors, course taking, and biological characteristics. Relatively little research has been done on this topic with college students. However, one especially pertinent study found that attitudes toward work and accomplishment substantially reduced sex differences in over- and underprediction of GPA (Veldman 1968).

The second explanation is psychometric (Humphreys 1986; Linn 1983, 1984; Linn and Werts 1971; Reilly 1973). Unreliability in the predictors or differences in their unreliability for women and men can produce or magnify over- and underprediction. But unreliability can have only a very limited effect on over- and underprediction by the SAT and ACT, for these tests are highly reliable. The SAT Verbal (V) and Mathematical (M) scores, as well as the ACT composite score, have an internal-consistency reliability of .91 or more (American College Testing Program 1973; Donlon 1984b). Selection, either explicit selection by the institution or self-selection by the applicants to the institution, can also create or increase over- and underprediction. Selection cannot cause the *tendency* for underprediction of women's college grades by admissions tests (Humphreys 1986), for women's admissions test scores are generally lower in the SAT and ACT test-taking population (American College Testing Program 1988; Donlon 1984a), while women's grades are higher in most colleges (e.g., Clark and Grandy 1984; Hewitt and Goldman 1975). But selection can affect the *extent* of underprediction for women in individual institutions.

The general purpose of this investigation was to explore the reasons for sex differences in over- and underprediction of college grades when the SAT is used alone and in combination with high school grades. More specifically, the aims were to examine the role that sex-related differences in the nature of the grade criterion and in variables associated with academic performance play in the over- and underprediction.

METHOD

Sample

The sample consisted of the 4,351 students in the fall 1988 entering class at the main campus of a large state university in the Northeast. This institution was chosen for study because it typifies a major state university; its student body is large and diverse; and its students, though affiliated with separate undergraduate colleges, take many common courses, all given by the same staff (Arts and Sciences Faculty).

Table 1. Sample Size Per College

College	*Women*	*Men*	*Total*
Liberal Arts College A	662		662
Liberal Arts College B	324	382	706
Liberal Arts College C	791	719	1,510
Arts College	67	47	114
Engineering College	117	552	669
Environmental Sciences College	237	276	513
Pharmacy College	120	57	177

The sample was limited to full-time freshmen enrolled in the undergraduate schools on the campus: three liberal arts colleges (Liberal Arts College A, Liberal Arts College B, and Liberal Arts College C) and four professional schools (Arts College, Engineering College, Environmental Sciences College, and Pharmacy College). (The two other undergraduate colleges on the campus, Business College and Evening College, do not enroll full-time freshmen.)[2] All the schools except Liberal Arts College A are coeducational. The number of women, men, and total students in the study cohort in each college are listed in Table 1. The total number of students in each school ranged from 1,510 for Liberal Arts College C to 114 for Arts College.

Grade Criteria

Two grade criteria were used. One was the raw GPA for the first semester. (Grades for the entire freshman year were unavailable when the study was conducted, and many of the questionnaire measures that were employed concern first-semester courses.) This GPA was calculated in the same way as the one used for administrative purposes by the university: all degree credit courses were included, and they were weighted by the number of credit hours. But, unlike the university GPA, this GPA included NC (no credit) grades that are assigned to Liberal Arts College B students in lieu of F's for degree credit courses, and temporary grades. NC grades were treated the same as F's, and temporary grades were treated the same as permanent ones. (NC grades were included to make the grades for Liberal Arts College B students comparable to those of the other students; temporary grades were included because they are very common and usually are the same as the permanent grades.)

The second criterion was an adjusted GPA that controlled for grading standards in individual courses. The object was to adjust the course grades by eliminating course differences in the average grades received by students in the cohort that are not attributable to the students' academic preparation, ability, and motivation. A set of 13 variables

2. The names of all the colleges have been changed.

was used that describe the students in each course who were from the study cohort:

1. Percentage who had taken high school honors courses in arts and music[3]
2. Percentage who had taken high school honors courses in English
3. Percentage who had taken high school honors courses in foreign and classical languages
4. Percentage who had taken high school honors courses in mathematics
5. Percentage who had taken high school honors courses in natural sciences
6. Percentage who had taken high school honors courses in social sciences and history
7. Percentage choosing a college major in the humanities
8. Percentage choosing a college major in the natural sciences
9. Percentage choosing a college major in architecture and engineering
10. Percentage choosing a college major in the social sciences
11. Percentage choosing a college major in other fields
12. Percentage of college-bound seniors in high school
13. Percentage for whom data were available on high school honors courses or college major

The source of the data on high school honors courses and college majors was the Student Descriptive Questionnaire (SDQ), completed by students when they registered for the SAT and recorded in the university's Longitudinal Data Base (LDB). College majors were grouped into categories derived from the SDQ classification.[4] The source of percentage of college-bound seniors in high school was the Attending Institution Profile Survey of high school officials conducted by Educational Testing Service (ETS) in 1988; the students' high schools were recorded in the LDB. Percentage for whom data were available on high school honors courses or college major was included to adjust for the effect of missing data on these variables by capitalizing on the information inherent in the data's presence or absence (Cohen and Cohen 1983). Data on both were missing for 988 students (22.7 percent of the cohort); data on college-bound seniors were missing for only 60 students (1.4 percent of the cohort).

Other available measures of academic preparation, ability, and motivation, such as amount of high school course work, high school grades, and SAT scores, were not used because these variables were needed as explanatory variables or to define the criteria in the main analyses.

The cohort enrolled in 498 courses. In 119 courses, data on each variable were available for 10 or more students. These 119 accounted for 94.7 percent (18,200) of the 19,218 grades earned by the cohort. The multiple correlation of the set of student variables with mean course grade was .47 for the 119 courses.[5] This correlation was computed with the weighted least-squares method, the weight being the mean *N* for the variables in the course. (The *N* for each variable differed because of missing data.) Two variables, percentage choosing a college major in the natural sciences and percentage choosing a college major in other fields, were excluded in computing the correlation because of their collinearity with the other college-major variables. The corresponding regression equation was used to predict the mean grade for each of the 119 courses and, in turn, to determine the grade adjustment (actual mean grade − predicted mean grade).

The 379 courses that were not included in the regression analysis were combined to achieve samples of 10 or more students, pooling the data for individual students in each combined course and then calculating that course's student variables and mean grade. Most of these courses (320) could be pooled by subject (using the university's subject classification) to reach this size, resulting in 20 pooled courses; the remaining courses (59) were pooled across subjects to create a single pooled course. The regression equation for the 119 individual courses was applied to each of the pooled courses to predict the mean grade and to determine the grade adjustment.

The grade adjustment for the course was applied to the grade of each student in it. For instance, if a student's actual grade in a course is 3.0, and the grade adjustment for that course is −.5 (the actual mean grade is 3.5 and the predicted mean grade is 3.0), then that student's adjusted grade is 2.5. Adjusted GPAs for the students were then calculated from these adjusted course grades.

SAT Scores and High School Rank

SAT scores and HSR were obtained from the LDB; the original source of both variables was official records. The pair of SAT scores with the highest total was used when several sets of scores were available; this is the practice followed in the university's admission procedures. HSR was converted to normalized T scores.

3. More precisely, the percentage for each honors course variable is the percentage of those taking (or planning to take) courses in that discipline who were (or planned to be) in honors, advanced placement, or accelerated courses.

4. The SDQ and the classification of college majors appear in the Appendix.

5. The raw score regression equation was: .0756 (percentage art and music honors courses) + .2718 (percentage English honors courses) + .4511 (percentage foreign and classical languages courses) − .6827 (percentage mathematics honors courses) − .0923 (percentage natural sciences courses) + 1.2626 (percentage social sciences and history courses) + .4770 (percentage humanities major) − .0616 (percentage architecture and engineering major) − .1337 (percentage social sciences major) + 3.0539 (percentage college-bound seniors) − 1.2487 (percentage with data available on honors courses or major) + 1.0608.

Explanatory Variables

Identifying Variables

Research literature on sex differences was reviewed to identify variables that might account for the underprediction of grades for women. In view of the massive quantity of this literature, existing reviews were used when available. Variables were identified that (*a*) generally displayed sex differences in means or correlations; (*b*) were logically connected with performance on admissions tests or in college, unless evidence existed to the contrary; and (*c*) described the student's current status rather than precursors, such as parental, teacher, or classroom variables. When several closely related variables—self-confidence in task performance, confidence in learning mathematics, self-concept of mathematics ability, and mathematics anxiety—satisfied these requirements, self-confidence in task performance was chosen for its generality.

The variables selected through this process were:

1. Mathematics courses (Armstrong 1985; Benbow 1988; Chipman and Thomas 1985; Pallas and Alexander 1983)
2. Grades (Anastasi 1958; Maccoby 1966; Maccoby and Jacklin 1974; Stockard, Lang, and Wood 1985)
3. Self-confidence in task performance (Eccles 1983, 1984; Lenney 1977; Maccoby and Jacklin 1974; Mednick and Weissman 1975; Parsons et al. 1976; Petersen 1980; Stein and Bailey 1973)
4. Usefulness of mathematics (Armstrong 1985; Benbow 1988; Brush 1985; Casserly and Rock 1985; Chipman and Wilson 1985; Eccles 1983, 1984; Fox, Tobin, and Brody 1979; Kavrell and Petersen 1984; Lockheed et al. 1985)
5. Educational aspirations (Marini 1978)
6. Handwriting (Graham 1986; Hughes, Keeling, and Tuck 1983; Lincoln 1927)
7. Study methods (Biggs 1970; Goldston et al. 1977; Holtzman, Brown, and Farquhar 1954; Houston 1987; Ramanaiah, Ribich, and Schmeck, 1975; Schmeck and Ribich 1978; Schmeck, Ribich, and Ramanaiah 1977; Thompson 1976)
8. Locus of control (Bar-Tal and Bar-Zohar 1977; Findley and Cooper 1983; Lefcourt 1982; Maccoby and Jacklin 1974; Stipek and Weisz 1981)
9. Test anxiety (Maccoby and Jacklin 1974; Stein and Bailey 1973)

Obtaining Measures[6]

LDB and Academic Questionnaire I. Measures were selected, adapted, or devised for these variables. Several measures were available from the LDB. Existing scales with known reliability and validity were used for the remaining variables, when available. New scales were constructed and existing scales adapted when necessary, so that the scales were balanced in keying and the items were minimally redundant in content and suitable for incoming college students in this country. *Agree/True or Disagree/False* response options were used.

Two variables were broadened in scope. Mathematics courses was extended to course work in six areas, encompassing the humanities, natural sciences, and social sciences. And self-confidence in task performance was conceptualized as confidence in learning in four areas spanning the humanities, natural sciences, and social sciences.

The LDB measures follow. The SDQ was the original source for all of the variables except high school units earned, which came from official records. This questionnaire was available for 3,461 students (79.5 percent of the study cohort).

1. High school units taken:
   a. English
   b. Foreign and classical languages[7]
   c. Mathematics
2. Years of high school courses taken (or planned):
   a. Arts and music
   b. English
   c. Foreign and classical languages
   d. Mathematics
   e. Natural sciences
   f. Social sciences and history
3. Average grades for high school courses taken (A to E/F):
   a. Arts and music
   b. English
   c. Foreign and classical languages
   d. Mathematics
   e. Natural sciences
   f. Social sciences and history
4. Degree goal, in years[8]

Measures of the remaining variables were incorporated in Academic Questionnaire I:

1. Confidence in English scale—six items adapted from the Confidence in Learning Mathematics scale (Fennema and Sherman 1976). This is a measure of confidence in learning English.
2. Confidence in Mathematics scale (Armstrong 1979)—an eight-item scale. This is a measure of confidence in learning mathematics.
3. Confidence in Science scale—six items adapted from various sources (Confidence in Learning Mathematics scale [Fennema and Sherman 1976]; Math Anxiety scale [Boswell and Katz 1980]; and

6. Academic Questionnaire I, Academic Questionnaire II, the scoring keys for the final scales for Academic Questionnaire I, and the classification of courses used in scoring Academic Questionnaire II appear in the Appendix.

7. French, German, Hebrew, Latin, Spanish, and other languages combined.

8. Two-year associate of arts or sciences degree = 14, bachelor's degree = 16, master's degree = 17, doctoral or related degree = 19.

Math is Easy/Difficult, English is Easy/Difficult, and Math is Enjoyable/Anxiety-Provoking scales [Brush 1980]). This is a measure of confidence in learning science.

4. Confidence in History scale--six items adapted from various sources (Math Anxiety scale [Stallings 1979]; Task Competence Motivation scale [Boswell and Katz 1980]; Anxiety in Mathematics scale [Armstrong 1979]; and Future Expectancies for Math and Difficulty of Current Math scales [Parsons 1980]). This is a measure of confidence in learning history.
5. Usefulness scale (Armstrong 1979)—six items from the scale. This is a measure of attitudes about the usefulness of mathematics.
6. Study Methods scale (Entwistle et al. 1971)—11 items adapted from the scale. This is a measure of good study habits.
7. Locus of Control scale—14 items adapted from the Multidimensional-Multiattributional Causality scale—Achievement (Lefcourt et al. 1979). This is a measure of locus of control in academic achievement situations.
8. Test Anxiety scale—the 19 items from the Facilitating Anxiety and Debilitating Anxiety scales of the Academic Achievement Test (Alpert and Haber 1960). This is a measure of text anxiety.
9. Handwriting scale—six original items (no existing scale could be located). This is a measure of handwriting legibility.

Each of these scales was subsequently item analyzed using a random sample of 400 students from the study cohort. Biserial correlations were computed between each item and the total score for its scale (excluding the item). Six items on the Locus of Control scale and one on the Study Methods scale failed to have significant correlations ($p < .05$, one-tail) with their total scores. Six items were eliminated from the former scale, including three that were dropped to balance the scale in content and keying; three items with nonsignificant correlations were retained to achieve balanced content across its subscales (ability, effort, context, and luck). One item was eliminated from the Study Methods scale.

Academic Questionnaire II. A second set of explanatory variables, all concerned with studiousness, was formulated. These variables deal with actual behavior in each first-semester course. (Information was sought only about courses with three or more credits, in order to simplify the students' task.) These variables, listed below, were included in Academic Questionnaire II, an open-ended questionnaire:

1. Detailed notes taken—detailed (1) versus scattered or none at all (0)
2. Hours of studying or doing assignments
3. Percentage of required reading completed
4. Percentage of required assignments completed
5. Percentage of tests or quizzes taken when scheduled
6. Percentage of class meetings missed
7. Percentage of recitation section meetings missed

Separate scores for each variable were obtained for humanities, natural sciences, social sciences, and other courses (defined using an adaptation of the university's subject classification) and for all courses. The scores were the means for all courses in the category. Percentage responses (for variables 3 to 7) were dichotomized (100 percent = 1, 0 to 99 percent = 0) to reflect pronounced breaks in the score distributions. Responses were excluded for variables 3 and 4 (percentage of required reading completed and percentage of required assignments completed) for courses when three or more students volunteered there were no requirements of that particular kind.

Descriptive Variables

A number of descriptive variables were obtained from the LDB.

Data Collection[9]

Academic Questionnaire I was administered during freshman orientation, immediately before the fall semester began, in all the schools except Liberal Arts College C. The questionnaire was mailed to the Liberal Arts College C students approximately two weeks before freshman orientation, with a cover letter requesting that the questionnaire be returned directly to ETS before the semester began. Follow-up letters were sent, about a week after freshman orientation, to the Liberal Arts College C students who had not mailed in questionnaires and to the students from the other schools who had not returned questionnaires at freshman orientation. Questionnaires received after the third week of the semester were excluded from the study. Usable questionnaires were obtained from 2,377 students (54.6 percent of the cohort).

Academic Questionnaire II was distributed in early November, about two weeks before the Thanksgiving recess, to freshman composition sections, with a cover letter requesting that the students return the questionnaire to their instructors. (The administration of this questionnaire was timed to minimize the possibility that responses would be affected by grades in the courses in question.) Questionnaires received a week or more after the recess ended were excluded from the study. Usable questionnaires were obtained for 1,721 students (39.6 percent of the cohort).

9. Copies of the letters accompanying the questionnaires appear in the Appendix.

Analyses

Parallel analyses were conducted for two kinds of residualized GPA criteria that represented over- and underprediction. One kind used predictions from SAT-V and SAT-M, and the other kind used predictions from SAT-V, SAT-M, and HSR. The predictions were made using regression equations for students in the cohort with complete data on the particular set of predictors (SAT scores or SAT scores and HSR) and GPA.[10] Separate versions of these criteria used raw GPA and adjusted GPA; the former were included only in initial analyses, and the latter in all analyses.

Intercorrelation matrices were computed using missing-data procedures. (Each correlation was based on all students for whom data were available.) Sex (Woman = 1, Man = 0), college, and ethnic group were dummy coded. Hierarchical regression analyses (Cohen and Cohen 1983) were employed to assess the associations of sex and the other variables with the criteria, as well as the interaction between sex and other variables. Increases in the squared multiple correlations (R^2) as the different variables and their product terms (representing interactions) were added to the regression indicated the independent effect of each kind of variable. This increase is the squared semipartial (or "part") correlation (sr^2) of the variable with the criterion, controlling the variable for the previously entered variables. (Specific details about particular analyses are described in the Results and Discussion section.)

Because of the large sample size, both statistical and practical significance were considered in assessing the results. The .01 significance level was employed throughout because of the sample size. (The total N for significance tests in the regression analyses was the smallest N for any of the zero-order correlations involved.) In general, a minimum effect size (Cohen 1988) was used that accounted for 1 percent of the variance (e.g., a correlation of .10, a difference in means [d] of .20 of a standard deviation). This size is commonly considered to be a "small" effect from the standpoint of practical significance (Cohen 1988). (A smaller effect size is described and used for some purposes in the analyses of the explanatory variables.)

RESULTS AND DISCUSSION

Grade Adjustments

The 24 courses with adjustments of ± .500 or more among the 119 individual courses appear in Table 2. (An adjustment of .5 represents a one-step increase on the university's grade scale.) The course adjustments ranged from 1.013 for mathematics—Topics in Mathematics for the Liberal Arts (actual mean grade, 2.135; predicted mean grade, 3.149) to −1.508 for Applied Music—Concert Band (actual mean grade, 4.000; predicted mean grade, 2.492). The adjustments for the courses combined by subject ranged from .318 for chemistry (actual mean grade, 2.235; predicted mean grade, 2.553) to −.749 for Puerto Rican and Hispanic Caribbean studies (actual mean grade, 2.667; predicted mean grade, 1.917). The adjustment was −.239 (actual mean grade, 3.023; predicted mean grade, 2.784) for the courses combined across subjects.

The raw and adjusted GPAs appear in Table 3. The mean raw and adjusted GPAs were very similar for the cohort: 2.57 and 2.59, respectively. The two GPAs were also very similar for each sex: 2.61 and 2.63 for women, and 2.52 and 2.55 for men. In addition, the two GPAs correlated .99 (N = 4,307, $p < .01$) for the cohort.

The raw and adjusted GPAs for each college appear in Table 4. In contrast to the overall similarity between the two GPAs, substantial mean differences existed among the colleges (F[6; 4,306] = 47.74, $p < .01$; eta squared = .06). The mean difference between raw and adjusted GPA ranged from .18 for the Pharmacy College to .00 for Liberal Arts College B. The mean difference for the Pharmacy College was far greater (d = 1.00) than that of any other college, including the Engineering College.

In short, despite the sometimes substantial adjustments to course grades, GPA was largely unaffected, indicating that the positive and negative adjustments tended to cancel each other out because most students—women and men alike—took courses with easy standards as well as courses with hard standards. Consequently, the GPA disparity for the sexes remained after the adjustments. The marked differences in the adjustments among schools, especially for the Pharmacy College, are an important exception to the overall similarity of raw and adjusted GPAs. This finding indicates that students in the various schools did not take the same mix of courses, and the Pharmacy College students took courses with particularly hard standards. These school differences support the validity of the grade-adjustment procedures and the use of adjusted GPA in subsequent analyses.

Representativeness of Questionnaire Data

Tables 5 to 10 summarize comparisons of students with and without data for each of the questionnaires (SDQ, Academic Questionnaire I, and Academic Questionnaire II) for a large number of pertinent variables available for most or all students (the smallest N for these variables is 4,032 for HSR). The tables report, for each subgroup of students, means and standard deviations for continuous variables and proportions for nominal variables.

A number of statistically significant ($p < .01$) differences occurred for each questionnaire, but few represented even a small effect size (d = .20 for differences between means for continuous variables, and w = .10 for differ-

10. For raw GPA, the multiple correlation was .36 for the SAT scores [the raw score regression equation was .02 (SAT-V) + .02 (SAT-M) + .64] and .42 for the SAT scores and HSR (the regression equation was .02 [SAT-V] + .01 [SAT-M] + .03 [HSR] − .76). For adjusted GPA, the corresponding statistics were .37 for the SAT scores (.02 [SAT-V] + .02 [SAT-M] + .65) and .44 for the SAT scores and HSR (.02 [SAT-V] + .01 [SAT-M] + .03 [HSR] − .81).

Table 2. Mean Actual and Predicted Course Grades, and Grade Adjustments for Courses with Grade Adjustments of ± .500 or More

Course	Course Grade			
	N	*Actual*	*Predicted*	*Adjustment*
Mathematics—Topics in Mathematics for the Liberal Arts	48	2.135	3.149	1.013
Journalism and Mass Media—Mass Media and Urban Life	42	2.119	2.968	.849
Mathematics—Honors Calculus	33	2.076	2.833	.757
Mathematics—Precalculus College Mathematics	651	1.849	2.548	.699
Geological Sciences—Introductory Geology	25	2.100	2.657	.557
Art—Artmaking	50	2.730	3.232	.502
Geological Sciences—Geology of the Moon and Planets	26	2.346	2.850	.504
Geological Sciences—Dinosaurs	43	3.267	2.760	−.508
Physics—General Physics Laboratory	18	3.194	2.687	−.508
Spanish—Advanced Grammar and Composition	29	3.500	2.992	−.508
Arts and Science, Liberal Arts College B—Freshman Honors	20	3.575	3.039	−.536
Hebraic Studies—Elementary Modern Hebrew	22	3.500	2.951	−.549
Agriculture and Environmental Science—Perspectives on Agriculture and the Environment	436	3.183	2.599	−.584
Military Education, Army—Introduction to Military Management	49	3.173	2.579	−.594
Spanish—Spanish Composition	21	3.452	2.821	−.632
Military Education, Air Force—The Air Force Today	24	3.083	2.374	−.709
History—Development of the United States	11	3.273	2.557	−.716
General Engineering—Honors Introduction to Engineering	35	3.486	2.688	−.798
Interdisciplinary Studies, Arts and Sciences Faculty—Masterpieces: Introduction to Humanities	40	3.762	2.951	−.811
Arts and Science, Liberal Arts College A—Scholars Program Freshman Seminar	21	3.714	2.885	−.829
Classics—Roman Civilization	12	2.917	2.088	−.829
Biological Sciences—Readings in General Biology	18	3.778	2.641	−1.136
Applied Music—Marching Band	47	3.979	2.597	−1.382
Applied Music—Concert Band	18	4.000	2.492	−1.508

ences between percentage distributions for categorical variables), and none achieved a medium effect size (d = .50 and w = .30).

For the SDQ, the small effects were for SAT-V (d = .20), SAT-M (d = .31), HSR (d = .33), high school units earned in mathematics (d = .30), age (d = −.32), and year of high school graduation (w = .21). The means for all of these continuous variables were higher for students for whom questionnaire data were available, and the categorical variable, year of high school graduation, involved a higher percentage of 1988 graduates for students with questionnaire data.

For Academic Questionnaire I, the small effects were for HSR (d = .37), raw GPA (d = .28), adjusted GPA (d = .29), number of grades (d = .26), sex (w = .14), and college (w = .20). The means for these continuous

Table 3. Means and Standard Deviations for SAT Scores, HSR, GPAs, Predicted GPAs, Residualized Criteria, and Explanatory Variables

Variable	Women			Men			Total			Mean Difference†
	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	
SAT-V	2,308	494.55	92.79	2,004	506.88	93.26	4,312	500.28	93.20	−.13**
SAT-M	2,308	540.61	94.75	2,004	594.14	95.59	4,312	565.49	98.81	−.54**
HSR	2,167	62.13	6.54	1,865	60.71	6.80	4,032	61.47	6.70	.21**
Raw GPA	2,293	2.61	.80	2,014	2.52	.88	4,307	2.57	.85	.11**
Adjusted GPA	2,293	2.63	.79	2,014	2.55	.87	4,307	2.59	.83	.10**
SAT predicted GPA—raw	2,308	2.51	.30	2,004	2.62	.30	4,312	2.56	.30	−.37**
SAT-HSR predicted GPA—raw	2,159	2.54	.35	1,849	2.57	.36	4,008	2.56	.36	−.08
SAT predicted GPA—adjusted	2,308	2.53	.30	2,004	2.65	.30	4,312	2.59	.30	−.40**
SAT-HSR predicted GPA—adjusted	2,159	2.57	.36	1,849	2.59	.37	4,008	2.58	.36	−.06
GPA residualized criterion—raw (SAT)	2,283	−.10	.75	1,985	.11	.82	4,268	.00	.79	−.27**
GPA residualized criterion—raw (SAT-HSR)	2,135	−.05	.74	1,831	.06	.79	3,966	.00	.77	−.14**
GPA residualized criterion—adjusted (SAT)	2,283	−.09	.73	1,985	.11	.80	4,268	.00	.77	−.26**
GPA residualized criterion—adjusted (SAT-HSR)	2,135	−.05	.72	1,831	.06	.78	3,966	.00	.75	−.15**
High school units taken										
English	2,310	4.08	.32	2,016	4.06	.32	4,326	4.07	.32	.06
Foreign and classical languages	2,318	3.59	1.34	2,033	3.20	1.28	4,351	3.41	1.32	.30**
Mathematics	2,307	4.18	.72	2,017	4.31	.72	4,324	4.24	.72	−.18**
Years of high school courses taken										
Arts and music	1,763	1.70	1.50	1,420	1.39	1.46	3,183	1.56	1.49	.21**
English	1,778	3.99	.33	1,493	3.96	.36	3,271	3.98	.35	.09**
Foreign and classical languages	1,779	3.32	.90	1,480	3.05	.90	3,259	3.19	.91	.30**
Mathematics	1,762	3.93	.49	1,482	4.02	.46	3,244	3.97	.48	−.19**
Natural sciences	1,743	3.50	.77	1,478	3.69	.72	3,221	3.59	.75	−.25**
Social sciences and history	1,773	3.21	.83	1,491	3.20	.82	3,264	3.21	.82	.01
Average grades for high school courses taken										
Arts and music	1,306	3.77	.44	939	3.69	.51	2,245	3.74	.47	.17**
English	1,798	3.46	.54	1,509	3.27	.55	3,307	3.72	.56	.34**
Foreign and classical languages	1,790	3.56	.60	1,493	3.33	.67	3,283	3.46	.64	.36**
Mathematics	1,800	3.27	.68	1,506	3.35	.64	3,306	3.07	.66	−.12**
Natural Sciences	1,793	3.32	.62	1,509	3.34	.61	3,302	3.33	.62	−.03
Social sciences and history	1,794	3.48	.58	1,514	3.45	.59	3,308	3.47	.59	.05
Degree goal	1,402	17.44	1.24	1,183	17.40	1.21	2,585	17.42	1.23	.03
Confidence in English scale	1,417	4.04	1.97	960	3.32	2.02	2,377	3.75	2.02	.36**
Confidence in Mathematics scale	1,417	5.27	2.60	960	6.34	2.18	2,377	5.70	2.49	−.43**
Confidence in Science scale	1,417	3.00	1.93	960	3.86	1.79	2,377	3.35	1.92	−.45**
Confidence in History scale	1,417	4.45	1.85	960	4.88	1.54	2,377	3.04	1.74	−.25**
Usefulness scale	1,417	3.96	2.08	960	4.61	1.71	2,377	4.22	1.96	−.33**
Study Methods scale	1,417	4.73	2.23	960	4.43	2.24	2,377	4.61	2.24	.13
Locus of Control scale	1,417	3.18	1.54	960	3.24	1.59	2,377	2.44	1.56	−.04**
Test Anxiety scale	1,417	10.50	3.52	960	9.32	3.60	2,377	10.02	3.60	.33**
Handwriting scale	1,417	4.76	1.34	960	3.72	1.82	2,377	4.34	1.63	.64**
Detailed notes taken										
Humanities	913	.43	.42	693	.32	.40	1,606	.38	.42	.26**
Natural sciences	705	.84	.33	626	.76	.36	1,331	.80	.34	.24**
Social sciences	677	.90	.28	414	.83	.34	1,091	.87	.30	.23**
Total	975	.70	.23	737	.62	.26	1,712	.66	.25	.32**
Hours of studying or doing assignments										
Humanities	907	4.10	2.30	687	3.80	2.10	1,594	3.98	2.21	14
Natural sciences	706	4.30	2.50	621	3.70	2.30	1,327	4.03	2.46	.24**

Table 3. (Continued)

Variable	Women N	Women Mean	Women S.D.	Men N	Men Mean	Men S.D.	Total N	Total Mean	Total S.D.	Mean Difference†
Social sciences	670	4.00	2.40	413	3.40	2.10	1,083	3.76	2.30	.26**
Total	970	4.18	2.05	732	3.73	1.98	1,702	3.99	2.03	.22**
Percentage of required reading completed										
Humanities	609	.55	.45	379	.43	.47	988	.50	.46	.26**
Natural sciences	507	.36	.45	491	.35	.43	998	.35	.44	.02
Social sciences	673	.38	.45	414	.30	.43	1,087	.35	.44	.18**
Total	971	.42	.36	735	.35	.37	1,706	.39	.37	.19**
Percentage of required assignments completed										
Humanities	491	.79	.38	296	.73	.42	787	.77	.39	.15
Natural sciences	226	.82	.38	208	.69	.46	434	.76	.43	.30**
Social sciences	217	.92	.27	152	.93	.24	369	.92	.26	−.04
Total	698	.82	.35	509	.74	.40	1,207	.79	.37	.22**
Percentage of tests or quizzes taken when scheduled										
Humanities	709	.96	.19	508	.96	.18	1,217	.96	.18	.00
Natural sciences	698	.89	.29	622	.90	.26	1,320	.89	.28	−.04
Social sciences	655	.96	.18	399	.97	.17	1,054	.96	.18	−.06
Total	968	.93	.19	734	.92	.19	1,702	.93	.19	.05
Percentage of class meetings missed										
Humanities	909	.65	.43	691	.64	.45	1,600	.64	.44	.02
Natural sciences	707	.72	.41	624	.72	.39	1,331	.72	.40	.00
Social sciences	675	.71	.42	413	.67	.44	1,088	.70	.43	.09
Total	976	.69	.34	734	.68	.35	1,710	.69	.34	.03
Percentage of recitation section meetings missed										
Humanities	110	.38	.48	102	.29	.45	212	.22	.47	.19
Natural sciences	607	.54	.46	559	.56	.45	1,166	.55	.45	−.04
Social sciences	225	.45	.49	179	.55	.50	404	.49	.49	−.20
Total	689	.54	.45	617	.56	.43	1,306	.55	.44	−.05

Note: *Ns* vary because of missing data. Academic Questionnaire II scores in other courses are omitted because of small *Ns*.

**$p < .01$.

†The mean difference is in *d* units (Cohen 1988): (women mean–men mean)/total standard deviation. A *d* of .20 is a "small" effect.

Table 4. Means and Standard Deviations of GPAs for Colleges

College	N	GPA Raw Mean	GPA Raw S.D.	GPA Adjusted Mean	GPA Adjusted S.D.
Liberal Arts College A	658	2.68	.76	2.70	.74
Liberal Arts College B	695	2.41	.86	2.41	.85
Liberal Arts College C	1,495	2.68	.82	2.69	.80
Arts College	111	2.85	.74	2.87	.71
Engineering College	664	2.38	.95	2.42	.93
Environmental Sciences College	508	2.57	.80	2.57	.80
Pharmacy College	177	2.41	.81	2.59	.79

variables were higher for students with questionnaire data. The categorical variable sex involved a higher percentage of women for students with data; the categorical variable college involved a higher percentage of Liberal Arts College A students and a smaller percentage of Liberal Arts College B students for those with questionnaire data.

For Academic Questionnaire II, the small effect was for college ($w = .16$). This variable involved a higher percentage of Liberal Arts College C students and a lower percentage of Engineering College students for those with data.

These results indicate that the students with questionnaire data were generally similar to the other students in the cohort on a wide array of relevant variables.

Sex Differences on SAT, HSR, GPAs, and Explanatory Variables

The means and standard deviations for SAT scores, HSR, GPAs, and explanatory variables appear in Table 3. A number of statistically significant ($p < .01$) sex differences were found, but only about half were even small effects. The only small or medium effects for the predictors were for SAT-M ($d = -.54$) and HSR ($d = .21$). The women's mean was lower than the men's on the former and higher on the latter. No small or medium effects occurred for raw or adjusted GPA.

Among the explanatory variables, small effects ap-

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Table 5. Comparisons of Students with and without Data for SDQ: Means and Standard Deviations for Continuous Variables

Variable	Present			Absent			Mean Difference†
	N	Mean	S.D.	N	Mean	S.D.	
Age	3,450	17.81	.53	886	18.03	1.08	−.32**
High school size	3,375	311.49	161.98	848	304.13	166.98	.05
Percentage college-bound seniors	3,431	69.20	17.57	860	69.92	18.49	−.04
High school units taken							
English	3,444	4.07	.32	882	4.07	.32	.01
Foreign and classical languages	3,461	3.42	1.28	890	3.38	1.48	.03
Mathematics	3,442	4.28	.70	882	4.07	.78	.30**
SAT-V	3,460	503.91	92.96	852	485.55	92.78	.20**
SAT-M	3,460	571.50	96.89	852	541.07	102.75	.31**
HSR	3,218	61.91	5.57	814	59.72	6.92	.33**
Raw GPA	3,433	2.59	.84	874	2.50	.87	.10**
Adjusted GPA	3,433	2.61	.82	874	2.52	.85	.12**
Number of grades	3,461	4.46	1.10	890	4.25	1.28	.19**

Note: *N*s vary because of missing data.

†The mean difference is in *d* units (Cohen 1988): (present mean–absent mean)/total standard deviation. A *d* of .20 is a "small" effect.

**$p < .01$ for *t* test.

peared for high school units taken (foreign and classical languages, $d = .30$), years of high school courses taken (arts and music, $d = .21$; foreign and classical languages, $d = .30$; and natural sciences, $d = -.25$), and average grades for high school courses taken (English, $d = .34$; and foreign and classical languages, $d = .36$). Women's means were higher than men's for all these variables with the exception of years of high school courses taken—natural sciences.

Small or medium effects occurred for most Academic Questionnaire I scales. Women's means were higher than men's for the Confidence in English scale ($d = .36$), Test Anxiety scale ($d = .33$), and Handwriting scale ($d = .64$). Women's means were lower than men's for Confidence in Mathematics, Science, and History scales ($d = -.43$, $-.45$, and $-.25$, respectively) and Usefulness scale ($d = -.33$).

Small effects also appeared for some of the Academic Questionnaire II measures: detailed notes taken (humanities, $d = .26$; natural sciences, $d = .24$; social sciences, $d = .23$; and total, $d = .32$), hours of studying or doing assignments (natural sciences, $d = .24$; social sciences, $d = .26$; and total, $d = .22$), percentage of required readings completed (humanities, $d = .26$); percentage of required assignments completed (natural sciences, $d = .30$; and total, $d = .22$), and percentage of recitation section meetings missed (social sciences, $d = -.20$). Women's means were higher than men's for all these variables except the last.

In short, the expected disparities for SAT-M and HSR and the minimal differences for SAT-V and GPA were observed. Sex differences occurred for most of the explanatory variables. However, the differences were not uniform for high school units taken, years of high school courses taken, and average grades for high school courses taken. And the differences were minimal for degree goals, Study Methods scale, and Locus of Control scale. The lack of difference for degree goals and the Study Methods scale was surprising in view of the research reviewed earlier that found mean differences; the lack of difference for the Locus of Control scale was anticipated, for the research described previously reported differences in correlations, but not means, for locus of control measures. Differences were also minimal for two kinds of Academic Questonnaire II measures: percentage of tests or quizzes taken when scheduled and percentage of class meetings missed.

Reliability of Academic Questionnaire I Scales

The internal-consistency reliability of the Academic Questionnaire I scales, estimated by coefficient alpha, appears in Table 11. Most of the reliabilities were in the .70s and .80s, with the exception of the Study Methods (.60) and Locus of Control (.41) scales. In short, the reliability was generally adequate—and often strikingly high, considering the shortness of the scales—but was marginal for the Locus of Control scale.

Regression Analyses

Initial Analyses

The means and standard deviations for the residualized GPA criteria, along with the corresponding GPAs and predicted GPAs, appear in Table 3. Sex had very similar correlations with the raw and adjusted GPA residualized criteria that used SAT ($r^2 = .0169$ with the raw criterion, $N = 4,268$, $p < .01$; $r^2 = .0172$ with the adjusted criterion, $N = 4,268$, $p < .01$). Sex had equally similar correlations with the corresponding SAT/HSR versions of the raw and ad-

Table 6. Comparisons of Students with and without Data for SDQ: Percentages for Categorical Variables

Variable	*Present*	*Absent*	*Difference*†
Sex	(*N* = 3,461)	(*N* = 890)	.03
Female	53.9%	50.8%	
Male	46.1	49.2	
Citizenship	(*N* = 3,459)	(*N* = 888)	.03
Citizen	92.0%	90.1%	
Noncitizen	8.0	9.9	
Ethnicity	(*N* = 3,461)	(*N* = 890)	.06**
White	68.7%	66.1%	
Asian	11.6	16.0	
Black	11.0	8.5	
Hispanic	7.2	8.2	
Other	1.6	1.2	
Father's education	(*N* = 3,393)	(*N* = 872)	.02
College graduate	54.1%	51.4%	
Non–college graduate	45.9	48.6	
Mother's education	(*N* = 3,450)	(*N* = 881)	.03
College graduate	37.2%	33.9%	
Non–college graduate	62.8	66.1	
High school type	(*N* = 3,444)	(*N* = 860)	.01
Public	83.9%	83.3%	
Private or religiously affiliated	16.1	16.7	
High school location	(*N* = 3,432)	(*N* = 860)	.01
Metropolitan area, large or medium city	19.4%	22.0%	
Small city or town, suburban community, or rural area	80.6	78.0	
Year of high school graduation	(*N* = 3,450)	(*N* = 886)	.21**
1988	99.4%	92.0%	
1987 or earlier	.6	8.0	
Reading or writing remedial placement	(*N* = 3,461)	(*N* = 890)	.04**
Placement	7.3%	10.0%	
No placement	92.7	90.0	
Mathematics remedial placement	(*N* = 3,461)	(*N* = 890)	.09**
Placement	15.4%	23.5%	
No placement	84.6	76.5	
College	(*N* = 3,461)	(*N* = 890)	.09**
Liberal Arts College A	15.8%	12.8%	
Liberal Arts College B	15.3	20.0	
Liberal Arts College C	35.2	32.9	
Arts College	2.3	4.0	
Engineering College	15.9	13.1	
Environmental Sciences College	11.2	14.2	
Pharmacy College	4.4	2.9	

Note: *N*s vary because of missing data. Percentages may not add to 100.0 because of rounding error.
†The difference between the two percentage distributions is in *w* units (Cohen 1988): $\sqrt{\chi^2/N}$. A *w* of .10 is a "small" effect.
**$p < .01$ for χ^2 test.

justed GPA criteria ($r^2 = .0058, N = 3{,}966, p < .01$ with the raw criterion; $r^2 = .0056$ with the adjusted criterion, $N = 3{,}966, p < .01$).

The means for the raw GPA criterion—SAT version were −.10 for women and .11 for men; the corresponding means for the adjusted GPA criterion—SAT version were −.09 and .11. The means for women and men were −.05 and .06, respectively, with both the raw and adjusted GPA criteria—SAT/HSR versions.

These results indicate that a small but statistically significant sex difference occurred in over- and underprediction, with underprediction for women. This difference was unaffected when adjusted GPA was used instead of raw GPA in the over- and underprediction measure but was noticeably reduced when HSR was added to the SAT prediction.

Both the raw and adjusted criteria were used in this initial analysis for comparative purposes; only the adjusted criteria were used in subsequent analyses.

Table 7. Comparisons of Students with and without Data for Academic Questionnaire I: Means and Standard Deviations for Continuous Variables

Variable	Present			Absent			Mean Difference†
	N	Mean	S.D.	N	Mean	S.D.	
Age	2,372	17.83	.57	1,964	17.89	.81	−.09**
High school size	2,313	312.54	161.59	1,910	306.95	164.69	.03
Percentage college-bound seniors	2,353	68.91	17.49	1,938	69.88	18.07	−.05
High school units taken							
English	2,363	4.08	.32	1,963	4.07	.32	.03
Foreign and classical languages	2,377	3.49	1.34	1,974	3.31	1.30	.14
Mathematics	2,363	4.28	.70	1,961	4.20	.74	.11**
SAT-V	2,361	507.27	91.01	1,951	491.82	95.12	.17**
SAT-M	2,361	574.16	95.62	1,951	550.00	101.58	.19**
HSR	2,214	62.59	6.48	1,818	60.11	6.70	.37**
Raw GPA	2,358	2.68	.81	1,949	2.44	.87	.28**
Adjusted GPA	2,358	2.70	.79	1,949	2.46	.86	.29**
Number of grades	2,377	4.55	1.06	1,974	4.26	1.21	.26**

Note: *N*s vary because of missing data.

†The mean difference is in *d* units (Cohen 1988): (present mean–absent mean)/total standard deviation. A *d* of .20 is a "small" effect.

**$p < .01$ for *t* test.

Interactions with College, Predictor, and Ethnicity[11]

Regression analyses of the interaction between sex and college with respect to the adjusted GPA residualized criteria are summarized in Table 12. (Liberal Arts College A and Liberal Arts College C, the two most similar colleges, were excluded in these analyses because of collinearity with the other dummy variables for college and sex.) The means and standard deviations for these criteria for each college appear in Table 13. The increase in the squared multiple correlation when the product terms for sex by colleges were added after sex and the college variables was not statistically significant in either analysis ($p > .01$), indicating that the two kinds of variables did not interact: sex differences in over- and underprediction did not vary among the colleges.

Regression analyses of the interaction between sex and predictor (SAT scores or SAT scores and HSR) with respect to the two GPA residualized criteria are summarized in Table 14. The predictors were SAT scores for the analysis of the SAT version of the criterion, and SAT scores and HSR for the analysis of the SAT/HSR version of the criterion. The scores for each set of predictors were the same multiple-regression-based predictions used in defining the adjusted GPA residualized criteria. The means and standard deviations for the criteria at different levels of the predictors appear in Table 15. The increase in the squared multiple correlation when the product term for sex by predictor was added after sex and the predictor was not statistically significant ($p > .01$) in either analysis, indicating that the two variables did not interact: sex differences in over- and underprediction did not vary with the level of the predictor.

Regression analyses of the interaction between sex and ethnicity with respect to the GPA residualized criteria are summarized in Table 16. (Hispanic and other, the two smallest groups, were excluded in these analyses because of collinearity with the other dummy variables for ethnic groups.) The means and standard deviations for these criteria for each ethnic group appear in Table 17. The increase in the squared multiple correlation when the product terms for sex by ethnic groups were added after sex and the ethnic group variables was not statistically significant ($p > .01$) in either analysis, indicating that the two variables did not interact: sex differences in over- and underprediction did not vary among ethnic groups.

Given the absence of interactions between sex and college, between sex and predictor, and between sex and ethnicity, subsequent regression analyses with the explanatory variables did not assess interactions with college, predictor, or ethnicity.

Covariance Analyses with Explanatory Variables[12]

Regression analyses for 15 sets of explanatory variables, sex, and the interaction between the explanatory variables and sex with respect to the two GPA residualized criteria are summarized in Table 18. These analyses are the multiple regression analog of analyses of covariance. The aim was to determine whether introducing the explanatory variables reduced the correlation of sex with the criteria. The main focus was the amount of increase in the squared multiple correlation when sex was added after the explanatory variables (i.e., the squared semipartial correlation of sex with the criterion).

The statistical significance of this squared semipartial correlation was appraised in both absolute terms (i.e., whether it was significant) and relative terms (i.e., whether

11. The intercorrelation matrix for this analysis is available from Lawrence J. Stricker.

12. The intercorrelation matrix for this analysis is available from Lawrence J. Stricker.

Table 8. Comparisons of Students with and without Data for Academic Questionnaire I: Percentages for Categorical Variables

Variable	*Present*	*Absent*	*Difference†*
Sex	(*N* = 2,377)	(*N* = 1,974)	.14**
Female	59.6%	45.6%	
Male	40.5	54.4	
Citizenship	(*N* = 2,375)	(*N* = 1,972)	.01
Citizen	91.8%	91.3%	
Noncitizen	8.2	8.7	
Ethnicity	(*N* = 2,377)	(*N* = 1,974)	.09**
White	71.3%	64.4%	
Asian	10.3	15.1	
Black	10.8	10.1	
Hispanic	6.2	8.8	
Other	1.4	1.6	
Father's education	(*N* = 2,334)	(*N* = 1,931)	.00
College graduate	53.6%	53.4%	
Non-college graduate	46.4	46.6	
Mother's education	(*N* = 2,365)	(*N* = 1,966)	.00
College graduate	36.5%	36.5%	
Non–college graduate	63.5	63.5	
High school type	(*N* = 2,357)	(*N* = 1,947)	.04**
Public	85.2%	82.1%	
Private or religiously affiliated	14.8	17.9	
High school location	(*N* = 2,352)	(*N* = 1,940)	.04**
Metropolitan area, large or medium city	18.4%	21.7%	
Small city or town, suburban community, or rural area	81.6	78.3	
Year of high school graduation	(*N* = 2,372)	(*N* = 1,964)	.06**
1988	98.6%	97.0%	
1987 or earlier	1.4	3.0	
Reading or writing remedial placement	(*N* = 2,377)	(*N* = 1,974)	.06**
Placement	6.4%	9.7%	
No placement	93.7	90.3	
Mathematics remedial placement	(*N* = 2,377)	(*N* = 1,974)	.08**
Placement	14.3%	20.3%	
No placement	85.7	79.7	
College	(*N* = 2,377)	(*N* = 1,974)	.20**
Liberal Arts College A	19.6%	10.0%	
Liberal Arts College B	11.4	22.0	
Liberal Arts College C	34.0	35.6	
Arts College	3.2	2.0	
Engineering College	16.6	13.9	
Environmental Sciences College	10.2	13.7	
Pharmacy College	5.1	2.8	

Note: *N*s vary because of missing data. Percentages may not add to 100.0 because of rounding error.
†The difference between the two percentage distributions is in *w* units (Cohen 1988): $\sqrt{\chi^2/N}$. A *w* of .10 is a "small" effect.
**$p < .01$ for χ^2 test.

it was smaller than the corresponding squared zero-order correlation of sex with the criterion). For the latter comparisons, an approximate significance-test was used: a *t* test for the difference between two zero-order correlations that have one variable in common (McNemar 1962).

The practical significance of the reduction in the squared semipartial correlation for sex was also evaluated. In view of the initially small effect sizes for sex (squared zero-order correlations of .0172 with the SAT version of the criterion and .0056 with the SAT/HSR version of the criterion), the minimum effect size in this study, representing 1 percent of the variance and translating into a squared correlation of .01, would be an unrealistic standard for assessing the reduction. Accordingly, a smaller effect size was adopted, for this purpose alone, that represents .25 percent of the variance, or a squared correlation of .0025 (about half the size of the squared correlation of sex with the SAT/HSR version of the criterion). This effect size also corresponds to a correlation of .05 and a difference in means (*d*) of .10 of a standard deviation.

Table 9. Comparisons of Students with and without Data for Academic Questionnaire II: Means and Standard Deviations for Continuous Variables

Variable	Present			Absent			Mean Difference†
	N	Mean	S.D.	N	Mean	S.D.	
Age	1,713	17.85	.62	2,623	17.86	.73	−.02
High school size	1,673	316.91	166.31	2,550	305.48	160.67	.07
Percentage college-bound seniors	1,703	69.17	17.57	2,588	69.47	17.88	−.02
High school units taken							
English	1,711	4.07	.31	2,615	4.08	.32	−.02
Foreign and classical languages	1,721	3.45	1.30	2,630	3.38	1.34	.06
Mathematics	1,710	4.24	.71	2,614	4.24	.73	.01
SAT-V	1,712	498.85	90.37	2,600	501.23	95.02	−.03
SAT-M	1,712	564.61	94.75	2,600	566.06	101.41	−.01
HSR	1,603	61.91	6.46	2,429	61.18	6.83	.11**
Raw GPA	1,720	2.66	.78	2,587	2.51	.88	.18**
Adjusted GPA	1,720	2.69	.76	2,587	2.53	.87	.19**
Number of grades	1,721	4.44	1.01	2,630	4.40	1.22	.04

Note: Ns vary because of missing data.

†The mean difference is in *d* units (Cohen 1988): (present mean–absent mean)/total standard deviation. A *d* of .20 is a "small" effect.

**$p < .01$ for *t* test.

A secondary focus was on the interaction between sex and the explanatory variables: increases in the squared multiple correlations when the product terms for sex by explanatory variables were added after the explanatory variables and sex. A significant increase would indicate an interaction: the regressions of the explanatory variables with the criteria differ for the sexes; hence, the effect of the explanatory variables on the correlation for sex cannot be interpreted.

Similar variables were grouped into sets in these analyses to reduce the number of significance tests and to simplify the interpretation of results. Only total scores were used for Academic Questionnaire II measures, except for detailed notes taken. Subject scores (humanities, natural sciences, social sciences) were used for this measure because they had substantially higher correlations with adjusted GPA than did the total score. (The subject score for other courses was dropped because of the small sample size.) The 15 sets were:

1. High school units taken—three variables
2. Years of high school courses taken—six variables
3. Average grades for high school courses taken—six variables
4. Degree goal
5. Confidence in English, Mathematics, Science, and History scales—four variables
6. Usefulness scale
7. Study Methods scale
8. Locus of Control scale
9. Test Anxiety scale
10. Handwriting scale
11. Detailed notes taken—three variables
12. Hours of studying or doing assignments
13. Percentage of required reading completed and percentage of required assignments completed—two variables
14. Percentage of tests or quizzes taken when scheduled
15. Percentage of class meetings missed and percentage of recitation section meetings missed—two variables

Analyses of the GPA Residualized Criterion—SAT Version. In 11 of the 15 analyses of the SAT version of the GPA residualized criterion, the interactions between the explanatory variables and sex were not significant statistically ($p > .01$) or practically ($sr^2 < .01$); therefore, the effects of the explanatory variables on the reduction of the correlation for sex could be interpreted. In these analyses, the correlation for sex (initially, $r^2 = .0172$) continued to be statistically significant ($p < .01$) after the explanatory variables were introduced. But five sets of explanatory variables significantly reduced (statistically [$p < .01$] and practically [$sr^2 > .0025$]) the correlation.[13] Average grades for high school courses taken ($sr^2 = .0087$), and percentage of required reading completed and percentage of required assignments completed ($sr^2 = .0086$) produced the greatest reductions; years of high school courses taken ($sr^2 = .0136$), Usefulness scale ($sr^2 = .0140$), and Study Methods scale ($sr^2 = .0142$) effected substantially smaller reductions. The estimated means for the criterion, adjusted for the effects of these five sets of variables, appear in Table 19.

These results indicate that sex differences in over- and underprediction were appreciably reduced when other dif-

13. The effect size was borderline ($sr^2 = .0024$) for one of these sets of variables, the Usefulness scale.

Table 10. Comparisons of Students with and without Data for Academic Questionnaire II: Percentages for Categorical Variables

Variable	*Present*	*Absent*	*Difference*†
Sex	(N = 1,721)	(N = 2,630)	.06**
Female	57.1%	50.8%	
Male	42.9	49.2	
Citizenship	(N = 1,720)	(N = 2,627)	.01
Citizen	92.0%	91.3%	
Noncitizen	8.0	8.7	
Ethnicity	(N = 1,721)	(N = 2,630)	.04
White	69.9%	67.0%	
Asian	11.2	13.3	
Black	10.6	10.4	
Hispanic	7.1	7.5	
Other	1.2	1.7	
Father's education	(N = 1,683)	(N = 2,582)	.01
College graduate	54.1%	53.1%	
Non-college graduate	45.9	46.9	
Mother's education	(N = 1,716)	(N = 2,615)	.01
College graduate	37.1%	36.2%	
Non-college graduate	62.9	63.8	
High school type	(N = 1,706)	(N = 2,598)	.02
Public	84.8%	83.1%	
Private or religiously affiliated	15.2	16.9	
High school location	(N = 1,704)	(N = 2,588)	.02
Metropolitan area, large or medium city	18.8%	20.6%	
Small city or town, suburban community, or rural area	81.2	79.4	
Year of high school graduation	(N = 1,713)	(N = 2,673)	.03
1988	98.4%	97.5%	
1987 or earlier	1.6	2.5	
Reading or writing remedial placement	(N = 1,721)	(N = 2,630)	.02
Placement	7.3%	8.2%	
No placement	92.7	91.8	
Mathematics remedial placement	(N = 1,721)	(N = 2,630)	.03
Placement	15.5%	18.1%	
No placement	84.5	81.9	
College	(N = 1,721)	(N = 2,630)	.16**
Liberal Arts College A	15.5%	15.1%	
Liberal Arts College B	16.2	16.2	
Liberal Arts College C	41.6	30.2	
Arts College	1.6	3.3	
Engineering College	9.7	19.1	
Environmental Sciences College	10.9	12.4	
Pharmacy College	4.5	3.8	

Note: Ns vary because of missing data. Percentages may not add to 100.0 because of rounding error.
†The difference between the two percentage distributions is in w units (Cohen 1988): $\sqrt{\chi^2/N}$. A w of .10 is a "small" effect.
**$p < .01$ for χ^2 test.

ferences between women and men on the five sets of explanatory variables were eliminated. Four of the five favored women; the exception was the Usefulness scale. That scale, unlike the other variables, was positively related to over- and underprediction—low scores on the scale were associated with underprediction.

The six remaining sets of explanatory variables did not reduce over- and underprediction either because they were minimally related to sex, to over- and underprediction, or to both. The ineffectiveness of high school units taken in contrast to years of high school courses taken may stem from the narrowness of the former. Years of high school courses taken includes courses in three additional areas (arts and music, natural sciences, and social sciences and history).

The four significant ($p < .01$, $sr^2 > .01$) interactions between sex and the sets of explanatory variables (degree goal; Confidence in English, Mathematics, Science, and History scales; detailed notes taken; and percentage of tests

Table 11. Internal-Consistency Reliability of Academic Questionnaire I Scales

Scale	*Number of Items*	*Reliability (N = 2,377)*
Confidence in English scale	6	.84
Confidence in Mathematics scale	8	.87
Confidence in Science scale	6	.74
Confidence in History scale	6	.79
Usefulness scale	6	.82
Study Methods scale	10	.60
Locus of Control scale	8	.41
Text Anxiety scale	19	.74
Handwriting scale	6	.71

Note: Internal-consistency reliability estimated using coefficient alpha.

or quizzes taken when scheduled) are portrayed in Figures 1 to 4.

Three of the four interactions involved a positive relationship between the explanatory variable and the criterion for women and a negative relationship for men. For degree goal, women with lower aspirations were underpredicted and men with lower aspirations were overpredicted. For the confidence in English, Mathematics, Science, and History scales, women with lower confidence were underpredicted and men with lower confidence were overpredicted. And for detailed notes taken, women not taking detailed notes were underpredicted and men not taking detailed notes were overpredicted.

In contrast to the other variables, percentage of tests or quizzes taken when scheduled was unrelated to the criterion for women and was negatively related for men. Men not taking examinations were overpredicted, but women not taking them were neither overpredicted nor underpredicted, more than other women.

It is noteworthy that all these interactions had one thing in common. Virtually no over- or underprediction oc-

Table 12. Summary of Regression Analyses of Interaction between Sex and College

	GPA Residualized Criteria			
	SAT (N = 4,268)		*SAT/HSR (N = 3,966)*	
Variables	R^2	R^2 *Increase*††	R^2	R^2 *Increase*††
Sex	.0172**		.0056**	
Sex and college†	.0401**	.0229**	.0433**	.0377**
Sex, college, and product	.0414**	.0014	.0460**	.0026

Note: *N*s for the two criteria differ because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.

†$n = 5$ for college.

††sr^2.

**$p < .01$.

Table 13. Means and Standard Deviations of GPA Residualized Criteria for Colleges

	Women			*Men*			*Total*			*Mean*
College	N	*Mean*	*S.D.*	N	*Mean*	*S.D.*	N	*Mean*	*S.D.*	*Difference*†
				GPA Residualized Criterion (SAT)						
Liberal Arts College A	655	−.17	.68				655	−.17	.68	—
Liberal Arts College B	314	−.06	.85	371	.13	.81	685	.05	.83	−.19
Liberal Arts College C	782	−.07	.70	707	.03	.74	1,489	−.03	.72	−.10
Arts College	64	−.58	.65	43	−.31	.76	107	−.48	.71	−.27
Engineering College	114	.24	.83	537	.28	.86	651	.27	.86	−.04
Environmental Sciences College	234	−.05	.66	270	.00	.77	504	−.02	.72	−.05
Pharmacy College	120	−.06	.76	57	.18	.79	177	.02	.78	−.24
				GPA Residualized Criterion (SAT/HSR)						
Liberal Arts College A	606	−.13	.67				606	−.13	.67	—
Liberal Arts College B	303	−.10	.80	342	.03	.78	645	−.03	.80	−.13
Liberal Arts College C	727	−.01	.68	646	.00	.71	1,373	.00	.69	−.01
Arts College	55	−.71	.68	37	−.63	.70	92	−.68	.68	−.08
Engineering College	111	.34	.80	501	.24	.82	612	.26	.82	.10
Environmental Sciences College	218	.00	.64	250	−.07	.73	468	−.04	.69	.07
Pharmacy College	115	.09	.72	55	.29	.80	170	.15	.75	−.20

Note: *N*s for the two criteria differ because of missing data.

†The mean difference is in actual units: women mean–men mean.

Table 14. Summary of Regression Analyses of Interaction between Sex and Predictor

	GPA Residualized Criterion			
	SAT (N = 4,268)		*SAT/HSR (N = 3,966)*	
Variables	R^2	R^2 *Increase*††	R^2	R^2 *Increase*††
Sex	.0172**		.0056**	
Sex and predictor†	.0178**	.0006	.0057**	.0001
Sex, predictor, and product	.0182**	.0004	.0071**	.0014

Note: Ns for the two criteria differ because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.

†The predictors are SAT scores for the SAT version of the criterion, and SAT scores and HSR for the SAT/HSR version of the criterion.

††sr^2.

**$p < .01$.

Table 15. Means and Standard Deviations of GPA Residualized Criteria for Levels of Predictors

	Women			*Men*			*Total*			*Mean*
Predictor Level†	N	*Mean*	*S.D.*	N	*Mean*	*S.D.*	N	*Mean*	*S.D.*	*Difference*††
					GPA Residualized Criterion (SAT)					
1.99 or less	132	−.12	.95	53	.23	.88	185	−.02	.94	−.35
2.00–2.49	796	−.08	.75	507	.11	.85	1,303	.00	.79	−.19
2.50–2.99	1,246	−.11	.68	1,195	.12	.79	2,441	.01	.75	−.23
3.00 or more	109	−.07	.83	230	.00	.72	339	−.02	.76	−.07
					GPA Residualized Criterion (SAT/HSR)					
1.99 or less	147	−.27	.88	102	.05	.93	239	−.15	.93	−.32
2.00–2.49	687	−.01	.76	605	.10	.85	1,292	.04	.81	−.11
2.50–2.99	1,068	−.04	.68	884	.07	.74	1,952	.01	.71	−.11
3.00 or more	233	−.10	.59	240	−.05	.60	473	−.08	.60	−.05

Note: Ns for the two criteria differ because of missing data.

†The predictors are SAT scores for the SAT version of the criterion, and SAT scores and HSR for the SAT/HSR version of the criterion. The predictor scores are grouped into intervals to simplify presentation of the data; continuous scores were used in the regression analyses.

††The mean difference is in actual units: women mean–men mean.

Table 16. Summary of Regression Analyses of Interaction between Sex and Ethnicity

	GPA Residualized Criterion			
	SAT (N = 4,268)		*SAT/HSR (N = 3,966)*	
Variables	R^2	R^2 *Increase*††	R^2	R^2 *Increase*††
Sex	.0172**		.0056**	
Sex and ethnicity†	.0384**	.0212**	.0283**	.0227**
Sex, ethnicity, and product	.0394**	.0010	.0299**	.0016

Note: Ns for the two criteria differ because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.

†$n = 3$ for ethnicity.

††sr^2.

**$p < .01$.

curred for either women or men with the most desirable scholarly attributes: those with high aspirations and high confidence, and those who made detailed notes and took tests when scheduled.

An additional regression analysis was carried out for the combined set of five explanatory variables that reduced the correlation for sex. These results are summarized in Table 20. The set of explanatory variables did not have a significant interaction with sex ($p > .01$), and the correlation for sex was no longer statistically significant ($p > .01$) after they were introduced ($sr^2 = .0012$). The estimated means for the criterion, adjusted for the effects of this set of variables, appear in Table 21.

These results indicate that sex differences in over- and

Table 17. Means and Standard Deviations of GPA Residualized Criteria for Ethnic Groups

Ethnic group	Women N	Women Mean	Women S.D.	Men N	Men Mean	Men S.D.	Total N	Total Mean	Total S.D.	Mean Difference†
GPA Residualized Criterion (SAT)										
White	1,509	−.16	.67	1,413	.05	.76	2,922	−.06	.72	−.21
Asian	354	.12	.82	178	.42	.92	532	.22	.87	−.30
Black	214	−.12	.79	222	.03	.86	436	−.04	.83	−.15
Hispanic	169	−.02	.79	144	.39	.86	313	.17	.84	−.41
Other	37	.11	.95	28	.03	.76	65	.07	.88	.08
GPA Residualized Criterion (SAT/HSR)										
White	1,413	−.11	.66	1,306	−.01	.72	2,719	−.06	.69	−.10
Asian	325	.12	.83	162	.40	.93	487	.22	.88	−.28
Black	200	−.04	.78	201	.02	.82	401	−.01	.80	−.06
Hispanic	164	.07	.76	136	.34	.84	300	.19	.81	−.27
Other	33	.22	.93	26	.08	.75	59	.16	.86	.14

Note: *N*s for the two criteria differ because of missing data.
†The mean difference is in actual units: women mean–men mean.

Table 18a. Summary of Covariance Analyses with Explanatory Variable: High School Units Taken ($n = 3$)

Variables	*GPA Residualized Criteria* SAT (N = 4,245) R^2	SAT R^2 Increase†	SAT/HSR (N = 3,945) R^2	SAT/HSR R^2 Increase†
Explanatory variable (covariate)	.0084**		.0044**	
Covariate and sex	.0240**	.0156**	.0087**	.0043**
Covariate, sex, and product	.0272**	.0032**	.0117**	.0030**

Note: *N*s vary because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.
†sr^2.
**$p < .01$.

Table 18b. Summary of Covariance Analyses with Explanatory Variable: Years of High School Courses Taken ($n = 6$)

Variables	*GPA Residualized Criteria* SAT (N = 3,069) R^2	SAT R^2 Increase†	SAT/HSR (N = 2,939) R^2	SAT/HSR R^2 Increase†
Explanatory variable (covariate)	.0105**		.0142**	
Covariate and sex	.0241**	.0136**	.0170**	.0028**
Covariate, sex, and product	.0254**	.0014	.0105**	.0015

Note: *N*s vary because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.
†sr^2.
**$p < .01$.

underprediction were essentially eliminated when differences between women and men on the combined set of the most individually effective explanatory variables were taken into account. This outcome is notable, for it demonstrates that a combination of variables could eliminate over- and underprediction, when individual variables were only able to minimize it. These findings are only suggestive, for the variables were chosen because of their effectiveness in the earlier analyses, and hence their joint effect in this analysis may be inflated to some unknown degree. Nonetheless, these results demonstrate that the explanatory variables, individually or in combination, are potentially able to eliminate over- and underprediction entirely.

Analyses of the GPA Residualized Criterion—SAT/HSR Version. Paralleling the earlier analyses, the same 11 sets of

Table 18c. Summary of Covariance Analyses with Explanatory Variable: Average Grades for High School Courses Taken ($n = 6$)

	GPA Residualized Criteria			
	SAT (N = 2,217)		*SAT/HSR* (N = 2,052)	
Variables	R^2	R^2 *Increase*†	R^2	R^2 *Increase*†
Explanatory variable (covariate)	.0775**		.0190**	
Covariate and sex	.0862**	.0087**	.0220**	.0030
Covariate, sex, and product	.0949**	.0087**	.0236**	.0016

*Note: N*s vary because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.
†sr^2.
**$p < .01$.

Table 18d. Summary of Covariance Analyses with Explanatory Variable: Degree Goal ($n = 1$)

	GPA Residualized Criteria			
	SAT (N = 2,562)		*SAT/HSR* (N = 2,392)	
Variables	R^2	R^2 *Increase*†	R^2	R^2 *Increase*†
Explanatory variable (covariate)	.0012		.0001	
Covariate and sex	.0183**	.0171**	.0057**	.0056**
Covariate, sex, and product	.0560**	.0377**	.0401**	.0343**

*Note: N*s vary because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.
†sr^2.
**$p < .01$.

Table 18e. Summary of Covariance Analyses with Explanatory Variable: Confidence in English, Mathematics, Science, and History Scales ($n = 4$)

	GPA Residualized Criteria			
	SAT (N = 2,342)		*SAT/HSR* (N = 2,186)	
Variables	R^2	R^2 *Increase*†	R^2	R^2 *Increase*†
Explanatory variable (covariate)	.0021		.0037	
Covariate and sex	.0202**	.0181**	.0079**	.0042**
Covariate, sex, and product	.0455**	.0253**	.0294**	.0215**

*Note: N*s vary because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.
†sr^2.
**$p < .01$.

Table 18f. Summary of Covariance Analyses with Explanatory Variable: Usefulness Scale ($n = 1$)

	GPA Residualized Criteria			
	SAT (N = 2,342)		*SAT/HSR* (N = 2,186)	
Variables	R^2	R^2 *Increase*†	R^2	R^2 *Increase*†
Explanatory variable (covariate)	.0079**		.0142**	
Covariate and sex	.0219**	.0140**	.0173**	.0032**
Covariate, sex, and product	.0222**	.0004	.0175**	.0002

*Note: N*s vary because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.
†sr^2.
**$p < .01$.

Table 18g. Summary of Covariance Analyses with Explanatory Variable: Study Methods Scale ($n = 1$)

	GPA Residualized Criteria			
	SAT (N = 2,342)		*SAT/HSR (N = 2,186)*	
Variables	R^2	R^2 *Increase*†	R^2	R^2 *Increase*†
Explanatory variable (covariate)	.0362**		.0223**	
Covariate and sex	.0504**	.0142**	.0266**	.0043**
Covariate, sex, and product	.0531**	.0027**	.0284**	.0018

Note: *N*s vary because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.
†sr^2.
**$p < .01$.

Table 18h. Summary of Covariance Analyses with Explanatory Variable: Locus of Control Scale ($n = 1$)

	GPA Residualized Criteria			
	SAT (N = 2,342)		*SAT/HSR (N = 2,186)*	
Variables	R^2	R^2 *Increase*†	R^2	R^2 *Increase*†
Explanatory variable (covariate)	.0019	.0004		
Covariate and sex	.0189**	.0170**	.0060**	.0056**
Covariate, sex, and product	.0189**	.0000	.0060**	.0000

Note: *N*s vary because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.
†sr^2.
**$p < .01$.

Table 18i. Summary of Covariance Analyses with Explanatory Variable: Test Anxiety Scale ($n = 1$)

	GPA Residualized Criteria			
	SAT (N = 2,342)		*SAT/HSR (N = 2,186)*	
Variables	R^2	R^2 *Increase*†	R^2	R^2 *Increase*†
Explanatory variable (covariate)	.0001		.0002	
Covariate and sex	.0173**	.0172**	.0056**	.0055**
Covariate, sex, and product	.0181**	.0008	.0067**	.0011

Note: *N*s vary because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.
†sr^2.
**$p < .01$.

Table 18j. Summary of Covariance Analyses with Explanatory Variable: Handwriting Scale ($n = 1$)

	GPA Residualized Criteria			
	SAT (N = 2,342)		*SAT/HSR (N = 2,186)*	
Variables	R^2	R^2 *Increase*†	R^2	R^2 *Increase*†
Explanatory variable (covariate)	.0041**		.0030	
Covariate and sex	.0178**	.0137**	.0067**	.0037**
Covariate, sex, and product	.0249**	.0071**	.0130**	.0062**

Note: *N*s vary because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.
†sr^2.
**$p < .01$.

Table 18k. Summary of Covariance Analyses with Explanatory Variable: Detailed Notes Taken ($n = 3$)

	GPA Residualized Criteria			
	SAT (N = 760)		*SAT/HSR (N = 760)*	
Variables	R^2	R^2 *Increase*†	R^2	R^2 *Increase*†
Explanatory variable (covariate)	.0332**		.0294**	
Covariate and sex	.0467**	.0134**	.0335**	.0041
Covariate, sex, and product	.0936**	.0469**	.1163**	.0828**

Note: *N*s vary because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.
†sr^2.
**$p < .01$.

Table 18l. Summary of Covariance Analyses with Explanatory Variable: Hours of Studying ($n = 1$)

	GPA Residualized Criteria			
	SAT (N = 1,694)		*SAT/HSR (N = 1,579)*	
Variables	R^2	R^2 *Increase*†	R^2	R^2 *Increase*†
Explanatory variable (covariate)	.0054**	0035		
Covariate and sex	.0208**	.0153**	.0083**	.0048**
Covariate, sex, and product	.0236**	.0028	.0148**	.0065**

Note: *N*s vary because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.
†sr^2.
**$p < .01$.

Table 18m. Summary of Covariance Analyses with Explanatory Variable: Percentage of Required Reading Completed and Percentage of Required Assignments Completed ($n = 2$)

	GPA Residualized Criteria			
	SAT (N = 1,201)		*SAT/HSR (N = 1,121)*	
Variables	R^2	R^2 *Increase*†	R^2	R^2 *Increase*†
Explanatory variable (covariate)	.1002**		.0886**	
Covariate and sex	.1088**	.0086**	.0901**	.0015
Covariate, sex, and product	.1136**	.0048	.0973**	.0072

Note: *N*s vary because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.
†sr^2.
**$p < .01$.

Table 18n. Summary of Covariance Analyses with Explanatory Variable: Percentage of Tests or Quizzes Taken when Scheduled ($n = 1$)

	GPA Residualized Criteria			
	SAT (N = 1,695)		*SAT/HSR (N = 1,581)*	
Variables	R^2	R^2 *Increase*†	R^2	R^2 *Increase*†
Explanatory variable (covariate)	.0547**		.0475**	
Covariate and sex	.0709**	.0162**	.0527**	.0051**
Covariate, sex, and product	.1128**	.0419**	.1178**	.0652**

Note: *N*s vary because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.
†sr^2.
**$p < .01$.

Table 18o. Summary of Covariance Analyses with Explanatory Variable: Percentage of Class Meetings Missed and Percentage of Recitation Section Meetings Missed ($n = 2$)

	GPA Residualized Criteria			
	SAT (N = 1,299)		*SAT/HSR (N = 1,205)*	
Variables	R^2	R^2 *Increase*†	R^2	R^2 *Increase*†
Explanatory variable (covariate)	.1019**		.0759**	
Covariate and sex	.1193**	.0175**	.0816**	.0057**
Covariate, sex, and product	.1212**	.0018	.0866**	.0050

Note: Ns vary because of missing data. The *N* shown is the smallest sample size for any of the zero-order correlations involved.
†sr^2.
**$p < .01$.

explanatory variables did not significantly interact with sex ($p > .01$, $sr^2 < .01$) in the analyses of the GPA residualized criterion. And four of the five sets of explanatory variables that significantly reduced ($p < .01$, $sr^2 > .0025$) the correlation for sex in the previous analyses did so again. (The Study Methods scale was the exception.) Percentage of required reading completed and percentage of required assignments completed produced a substantially greater reduction than the other sets of variables. The correlation for sex (initially $r^2 = .0056$) was no longer statistically significant ($p > .01$) when this set of variables ($sr^2 = .0015$) and average grades for high school courses taken ($sr^2 = .0030$) were introduced. And the correlation was significantly reduced by years of high school courses taken ($sr^2 = .0028$) and the Usefulness scale ($sr^2 = .0032$). The estimated means for the criterion, adjusted for the effects of these four sets of variables, appear in Table 19.

These results indicate that sex differences in over- and underprediction effectively disappeared or were markedly reduced when differences between women and men on the four sets of explanatory variables were eliminated. These findings are extremely similar to the earlier results, and the previous comments apply here, as well.

Several additional points about the present findings are worth emphasizing. First, the sex difference was smaller to begin with in these analyses than it was in the parallel analyses of the SAT version of the GPA residualized criterion, and two of the explanatory variables were able to reduce the difference so much that it was no longer even statistically significant.

Second, it is striking that average grades in high school courses taken continued to be effective in these analyses, just as it had been in the earlier ones, even though HSR was used in deriving the present criterion, effectively eliminating the influence of HSR. Average grades in high school courses taken appears to provide more differentiated information than does HSR.

The four significant ($p < .01$, $sr^2 > .01$) interactions between sex and the sets of explanatory variables are portrayed in Figures 5 to 8. These are the same explanatory variables that interacted with sex in the previous analyses. All the interactions in the present analyses were extremely similar to those in the previous analyses and may be interpreted in the same way.

An additional regression analysis was carried out for the combined set of four explanatory variables that reduced the correlation for sex. These results are summarized in Table 22. The set of explanatory variables did not have a significant interaction with sex ($p > .01$), and the correlation for sex was no longer statistically significant ($p > .01$) after they were introduced ($sr^2 = .0000$). The estimated means for the criterion, adjusted for the effects of this set of variables, appear in Table 21.

These findings, like those for the corresponding analysis for the SAT residualized criterion, indicate that sex differences in over- and underprediction essentially disappeared when differences between women and men on a set of the most effective explanatory variables were taken into account. The previous comments apply here, too. The present outcome was to be expected, for two of the explanatory variables effectively eliminated over- and underprediction by themselves.

CONCLUSIONS

Magnitude of Over- and Underprediction

The SAT, alone and in combination with HSR, did underpredict women's grades at the university in this study, but the amount of underprediction, though statistically significant, was small. For raw GPA, the underprediction was −.10 when SAT was used alone and −.05 when SAT and HSR were used together. (The corresponding overprediction for men was .11 and .06.) Concretely, the average woman, with a raw GPA of 2.61, would have a predicted GPA of 2.51 if the SAT were used, and of 2.56 if the SAT and HSR were used. (The corresponding figures for the average man are 2.52, 2.63, and 2.58).[14] This level of underprediction is very close to that reported in previous studies of the SAT and ACT. The −.05 underprediction for

14. The figures for predicted GPA reported in the Results and Discussion section diverge slightly because of sample differences associated with missing data.

Table 19. Covariate-Adjusted Means for GPA Residualized Criteria, Controlling for Selected Explanatory Variables

	GPA Residualized Criteria					
	SAT			*SAT/HSR*		
	Mean			*Mean*		
Explanatory Variable (Covariate)	*Women*	*Men*	*Mean Difference†*	*Women*	*Men*	*Mean Difference†*
Years of high school courses taken	−.087	.099	−.186	−.038	.043	−.081
Average grades for high school courses taken	−.067	.080	−.147	−.040	.045	−.085
Usefulness scale	−.087	.098	−.185	−.040	.046	−.086
Study Methods scale	−.086	.098	−.184	—	—	—
Percentage of required reading completed and percentage of required assignments completed	−.067	.077	−.144	−.027	.031	−.058
Unadjusted	−.095	.108	−.203	−.052	.060	−.112

Note: These means were estimated from the regression analyses.
†The mean difference is in actual units: women mean–men mean.

women, using the SAT and HSR, corresponds to −.06 in studies of the SAT and high school average or rank (Clark and Grandy 1984) and −.12 and −.05 in studies of the ACT and high school grades (American College Testing Program 1973; Sawyer 1986). (The .06 overprediction for men corresponds to .04 in the SAT studies and to .07 and .05 in the ACT studies.) Although the underprediction for women was small in the present investigation, women could still be disadvantaged if decisions about admissions, scholarships, and similar academic matters were made solely on the basis of grade predictions from the SAT or the SAT and HSR.

Several related points about the present results are worth noting. First, the underprediction for women was much less—about half—when the SAT was combined with HSR. This finding is also consistent with previous results. Underprediction for women dropped from −.17 to −.12 (and overprediction for men was cut from .10 to .07) in studies of the ACT when high school grades were added (American College Testing Program 1973). High school grades or rank presumably increase validity because they reflect work habits, motivation, and similar characteristics that are not captured by admissions tests. From a psychometric perspective, women's superior high school records compensate for their lower admissions test scores, thereby reducing underprediction; similarly, men's poorer high school records detract from their higher test scores, thereby reducing overprediction (Humphreys 1986; Linn and Werts 1971).

Second, the amount of underprediction for women was similar for different levels of SAT scores and of SAT scores and HSR; in particular, the underprediction did not increase at the higher levels. Even though the average degree of underprediction for women was small, substantially greater underprediction at higher levels on the SAT scores or on SAT scores and HSR would be especially troublesome, because scholarship awards are made at these levels.

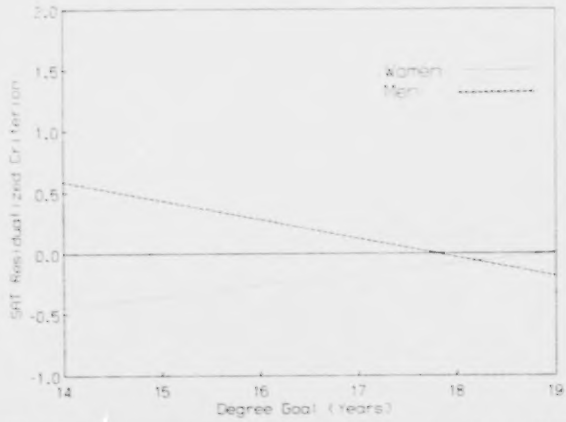

Figure 1. Interaction between degree goal and sex: SAT residualized criterion.

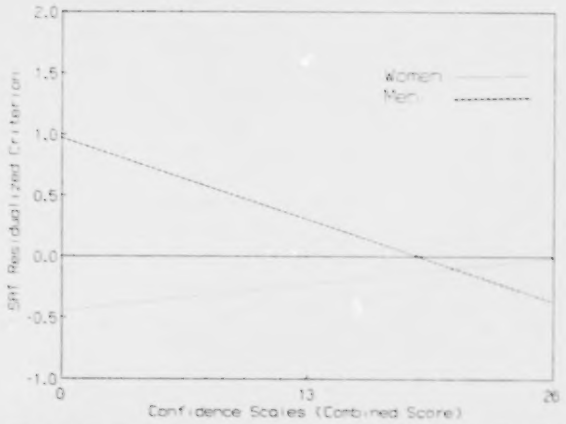

Figure 2. Interaction between Confidence in English, Mathematics, Science, and History scales and sex: SAT residualized criterion.

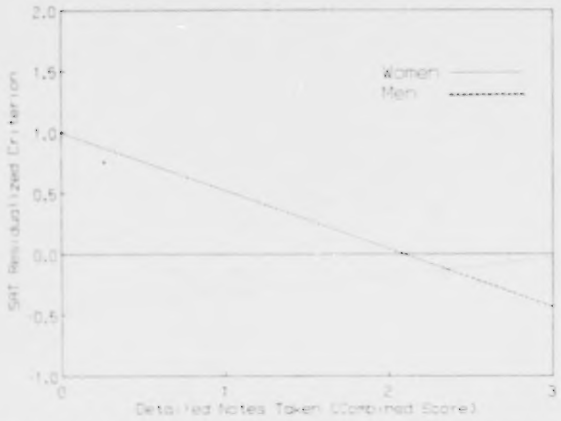

Figure 3. Interaction between detailed notes taken and sex: SAT residualized criterion.

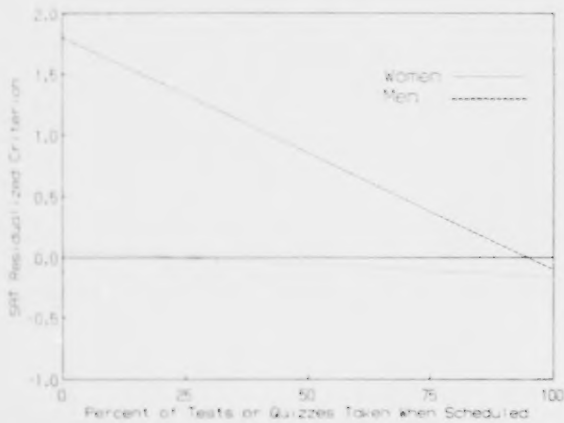

Figure 4. Interaction between percentage of tests or quizzes taken when scheduled and sex: SAT residualized criterion.

Table 20. Summary of Covariance Analysis with Combined Set of Explanatory Variables: GPA Residualized Criterion (SAT)

Variables	*GPA Residualized Criterion*	
	R^2	R^2 *Increase*††
	($n = 16$, $N = 632$)	
Explanatory variables (covariate)†	.1696**	
Covariate and sex	.1708**	.0012
Covariate, sex, and product	.2027**	.0319

Note: The *N* shown is the smallest sample size for any of the zero-order correlations involved.

†Years of high school courses taken ($n = 6$), average grades for high school courses taken ($n = 6$), Usefulness scale ($n = 1$), Study Methods scale ($n = 1$), and percentage of required reading completed and percentage of required assignments completed ($n = 2$).

††sr^2.

**$p < .01$.

Third, the underprediction for women did not differ from college to college. This result is striking in view of the seeming differences among the colleges in their institutional practices, student bodies, and general culture. Similarity in admissions procedures and the prevalence of common courses taken by students from all the colleges may work against college differences in underprediction.

Fourth, the underprediction for women also did not differ among ethnic groups. This finding is noteworthy, too, given the array of possible differences among these groups in educational experiences, attitudes and values, and the like. Selection, both explicit selection in the admissions process and self-selection by potential applicants, may produce an entering class that is relatively homogeneous, thereby minimizing group differences in underprediction.

Differences in Grading Standards

Course differences in grading standards had no noticeable impact on sex differences in over- and underprediction. These results contrast with previous studies that found the disparities in over- and underprediction were markedly reduced or entirely eliminated when differences in grading standards from course to course were taken into account. Most pertinent are two investigations that adjusted GPA (Elliott and Strenta 1988; Young 1991). Although these studies differed from each other and from the present one in the methods employed to adjust grades, the two were alike in relying on four-year GPA instead of the first-semester GPA used in the present investigation. Nonetheless, differences in the institutional practices and student bodies of the schools involved (Dartmouth College, Stanford University, and a large state university) are probably the most likely explanation for the divergent findings. The women and men in the present investigation may simply take more similar courses. This suggestion is consistent with the finding of one of these studies (Elliott and Strenta 1988) that the grade adjustment increased sex differences for first-year GPA (*d* going from .00 to .09); in contrast, the comparable grade adjustment in the present investigation for first-semester GPA had no effect (*d* going from .11 to .10).

Explaining Over- and Underprediction

Several explanatory variables were successful in reducing or effectively eliminating sex differences in over- and underprediction. The ability of a subset of these variables to make over- and underprediction statistically insignificant is especially important, for it removes any uncertainty about whether the degree of over- and underprediction remaining after these corrections has practical importance. The entire set of these explanatory variables, concerned with academic preparation, studiousness, and attitudes about mathematics, were characteristics in which the women and men differed and were associated with components of academic performance not predictable from SAT scores and HSR.

Table 21. Covariate-Adjusted Means for GPA Residualized Criteria, Controlling for Combined Set of Explanatory Variables

	GPA Residualized Criteria					
	SAT			*SAT/HSR*		
	Mean			*Mean*		
Explanatory Variable (Covariate)	*Women*	*Men*	*Mean Difference†*	*Women*	*Men*	*Mean Difference†*
Combined set††	−.031	.036	−.067	−.002	.001	−.003
Unadjusted	−.095	.108	−.203	−.052	.060	−.112

Note: These means were estimated from the regression analyses.

†The mean difference is in actual units: women mean–men mean.

††The combined set of covariates for the SAT version of the criterion were years of high school courses taken, average grades for high school courses taken, Usefulness scale, Study Methods scale, and percentage of required reading completed and percentage of required assignments completed. The corresponding set for the SAT/HSR version of the criterion were years of high school courses taken, average grades for high school courses taken, Usefulness scale, and percentage of required reading completed and percentage of required assignments completed.

The identification of these variables provides some insight into the sources of underprediction for women and the means for remedying it. Simply put, the SAT and HSR underpredict women's grades because women differ from men on these explanatory variables, and the variables are linked to grade getting and are not measured well by the SAT and HSR. Other variables also may be involved in this phenomenon, of course, and further work is needed to identify them, but the explanatory variables included in this study were intended to be as comprehensive as possible, and they were successful in accounting for underprediction.

Efforts to minimize underprediction for women can take two obvious tacks. First, the information conveyed by these variables is clearly germane to decisions about admissions, scholarships, and so forth. Putting more weight on these variables in admissions would reduce the disparities between women and men in these characteristics and, in turn, in over- and underprediction. This approach would have the side benefit of improving overall accuracy in forecasting academic performance and generally increasing academic success as better students are admitted. This idea is consistent with the common recommendation that admissions test scores should be only one factor in admissions decisions and need to be supplemented by a variety of other kinds of relevant information, including not only academic performance in high school, but also such things as extracurricular activities, personal qualities, and special experiences (American College Testing Program 1979; College Board 1988; National Association of College Admissions Counselors 1989).

Second, intervention programs can be introduced to help prospective or present students enhance their academic preparation, studiousness, and attitudes about mathematics, thereby reducing sex differences in these variables and in over- and underprediction while increasing the scholarliness of the students.

The implications of the explanatory variables concerned with confidence and studiousness that interacted

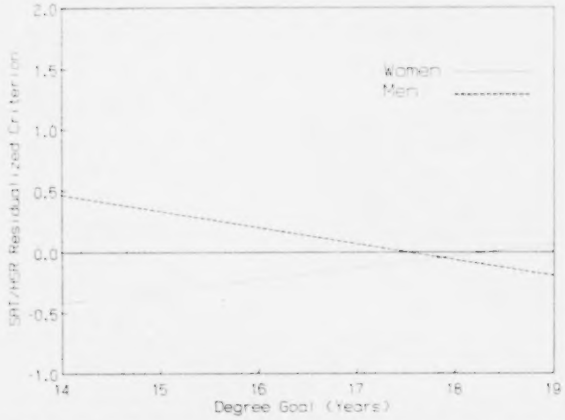

Figure 5. Interaction between degree goal and sex: SAT/HSR residualized criterion.

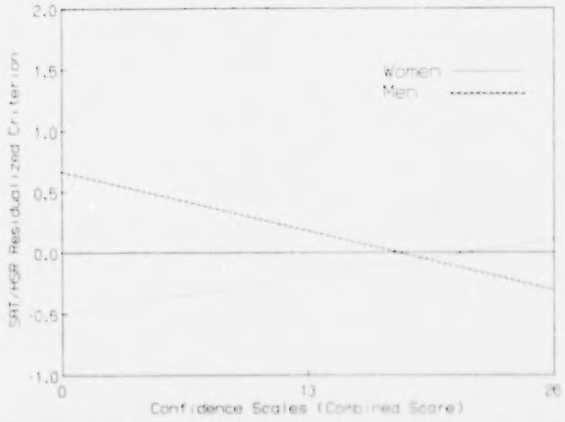

Figure 6. Interaction between Confidence in English, Mathematics, Science, and History scales and sex: SAT/HSR residualized criterion.

with sex are somewhat more complicated, but these variables also aid in understanding and remedying underprediction for women.

The interactions for the Confidence in English, Mathematics, Science, and History scales, as well as for degree goal, appear to represent the same underlying process. Women lacking confidence in their academic ability may compensate by working harder, while men in that situation simply give up.

The interaction for percentage of tests or quizzes taken when scheduled suggests that women may be conscientious about taking examinations, regardless of their preparation or motivation, while poorly prepared or motivated men avoid them.

The interaction for detailed notes taken is puzzling because not taking detailed notes was associated with underprediction for women, whereas the expected relationship between not taking detailed notes and overprediction was found only for men. (See the reviews by Carrier and Titus 1979; Hartley and Davies, 1978.) One conjecture is that failure to take notes reflects the same lack of confidence that was just discussed. In any event, it is evident that note taking by women and by men has very different consequences for their academic performance.

The interactions for the studiousness variables underscore the value of including such characteristics in remediation efforts. The interactions for the confidence variables are at least as important from the standpoint of remediation. It would clearly be inappropriate to consider confidence in admissions decisions (Messick 1963), but intervention programs to enhance this characteristic would be a legitimate means of reducing sex differences in confidence and, ultimately, in over- and underprediction.

Qualifications

Several qualifications about the conclusions are in order. No effort was made to deal with two psychometric issues that complicate the interpretation of differential prediction studies (Linn 1983; Linn and Werts 1971; Reilly 1973): unreliability of the predictors and selection. As noted earlier, in view of the SAT's high reliability, it is unlikely that unreliability had an appreciable effect in this situation. With respect to selection, it seems certain that some degree of underprediction for women would be found, even if no selection took place, given the general disparities, described earlier, in the SAT scores and college grades of women and men. However, whether the extent of underprediction would be greater or less than observed cannot be judged. Statistical corrections for selection would be hampered insofar as selection is based on unquantifiable variables and the basis for selection differs from student to student. Nonetheless, it is important to recognize that this study, like others on this topic, is based on data for students who were accepted and enrolled.

The grade criterion was based on only one semester's

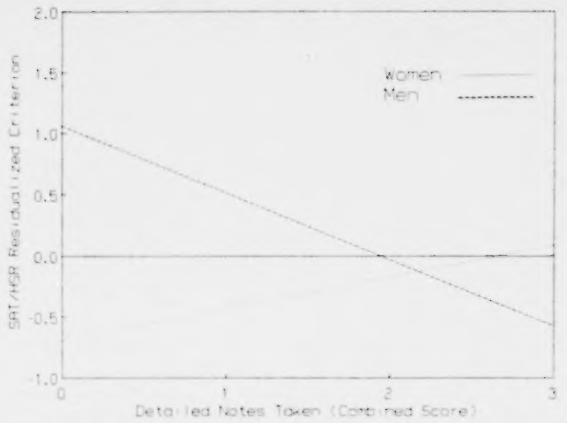

Figure 7. Interaction between detailed notes taken and sex: SAT/HSR residualized criterion.

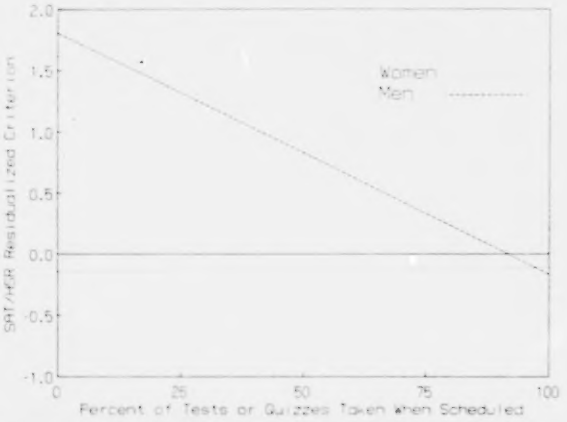

Figure 8. Interaction between percentage of tests or quizzes taken when scheduled and sex: SAT/HSR residualized criterion.

Table 22. Summary of Covariance Analysis with Combined Set of Explanatory Variables: GPA Residualized Criterion (SAT/HSR)

Variables	*GPA Residualized Criterion*	
	R^2	R^2 *Increase*††
	($n = 15$, $N = 632$)	
Explanatory variables (covariate)†	.3419**	
Covariate and sex	.3419**	.0000
Covariate, sex, and product	.3742**	.0231

Note: The *N* shown is the smallest sample size for any of the zero-order correlations involved.

†Years of high school courses taken ($n = 6$), average grades for high school courses taken ($n = 6$), Usefulness scale ($n = 1$), Study Methods scale ($n = 1$), and percentage of required reading completed and percentage of required assignments completed ($n = 2$).

††sr^2.

**$p < .01$.

grades. But underprediction appears to be a general phenomenon found in studies of first-semester GPA (e.g., American College Testing Program 1973), freshman GPA (e.g., Clark and Grandy 1984; Sawyer 1986), two-year GPA (e.g., Gamache and Novick 1985), and four-year GPA (e.g., Elliott and Strenta 1988; Young 1991). Furthermore, the same level of over- and underprediction was observed in comparable studies of freshman GPA (Clark and Grandy 1984).

The research was carried out at a single university. For the reasons discussed earlier, the findings about grade adjustments may not be generalizable to other institutions. However, the extremely strong similarity already noted between the present results and previous ones about the extent of over- and underprediction and the effect of combining admissions tests with high school grades clearly implies that these and other outcomes are generalizable.

The questionnaire measures were not available for a substantial fraction of the cohort, but the data seem to be missing more or less at random, judging by the extensive comparisons that were made; hence, the findings with these variables are generalizable to the entire cohort. The use of statistical methods (Little and Rubin 1987) that estimate missing scores from available data is problematic in the present study. Many of the variables available for most students are not closely related to the missing measures and thus would yield poor estimates of the needed scores. And some of the available variables were employed in deriving adjusted GPA, a constituent of the residualized criteria. Using the same variables to estimate an appreciable portion of the data for the explanatory variables would confound the associations between the explanatory variables and the criteria by eliminating the experimental independence between the two.

The reliance on self-reports in the questionnaire measures raises a question about the effects of conscious or unconscious distortion. Such distortion by students can obviously attenuate relationships of the measures with sex and the residualized GPA criteria, but it seems unlikely to produce artifactual associations with the criteria. In this connection, it should be recalled that the three questionnaires were completed before the final examinations were given and grades received—two of the three questionnaires even before the academic year began.

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APPENDIX A. CLASSIFICATIONS AND SCORES

Table A-1. Adaptation of SDQ Classification of College Majors for Grade Adjustment Analysis

Humanities
Arts: Visual and Performing
Communications
Foreign Languages and Classical Languages
Language and Literature
Philosophy, Religion, and Theology
Social Sciences
Business and Commerce
Education
Library and Archival Sciences
Public Affairs and Services
Social Sciences and History, General
Natural Sciences
Agriculture and Natural Resources
Biological (Life) Sciences
Computer and Information Sciences and Technologies
Health Professions and Allied Sciences
Home Economics
Mathematics
Physical Sciences

Table A-1 (Continued)

Architecture and Engineering
Architecture and Environmental Design
Engineering and Engineering Technologies

Other
General and Interdisciplinary Studies
Military Sciences
Technical and Vocational

Table A-2. Scoring Keys for Academic Questionnaire I
Scales

Scales
Confidence in English Scale
23(A), 31(D), 39(D), 40(D), 54(A), 59(A)
Confidence in Mathematics Scale
3(A), 13(A), 15(D), 20(D), 24(A), 26(D), 46(A), 78(A)
Confidence in Science Scale
43(D), 50(D), 58(A), 66(A), 70(D), 75(A)
Confidence in History Scale
1(A), 18(A), 33(D), 49(D), 53(A), 68(D)
Usefulness Scale
22(D), 27(A), 48(D), 56(A), 62(A), 69(A)
Study Methods Scale
6(A), 7(A), 34(D), 35(D), 36(A), 38(D), 42(D), 72(A), 79(D), 81(D)
Locus of Control Scale
9(A), 10(D), 21(D), 45(A), 55(A), 60(D), 73(A), 80(A)
Test Anxiety Scale
2(D), 4(D), 5(D), 11(D), 14(D), 17(A), 19(A), 25(A), 29(A), 30(A), 37(A), 44(A), 52(D), 61(D), 63(A), 64(D), 67(D), 71(A), 82(A)
Handwriting Scale
28(A), 32(A), 47(D), 65(D), 74(A), 76(D)

Table A-3. Adaptation of the University's Subject Classification of Courses for Scoring Academic Questionnaire II

	Humanities
(013)	African Languages and Literature
(049)	American Language Studies
(080)	Art
(081)	Art
(082)	Art History
(165)	Chinese
(190)	Classics
(192)	Communication
(195)	Comparative Literature
(200)	Dance
(350)	English: English Literature and Writing
(352)	English: American Literature
(354)	English: Film Studies
(420)	French
(470)	German
(490)	Greek
(500)	Hebraic Studies
(560)	Italian
(565)	Japanese
(580)	Latin
(615)	Linguistics
(667)	Medieval Studies

Table A-3 (Continued)

(700)	Music
(701)	Applied Music
(730)	Philosophy
(810)	Portuguese
(840)	Religion
(860)	Russian
(940)	Spanish
(965)	Theater Arts
(966)	Theater Arts

Natural Sciences

(015)	Agriculture and Environmental Science
(067)	Animal Sciences
(119)	Biological Sciences
(120)	Biology
(160)	Chemistry
(198)	Computer Science
(330)	Electrical and Computer Engineering
(372)	Environmental Resources
(375)	Environmental Science/Studies
(400)	Food Science
(440)	General Engineering
(460)	Geological Sciences
(495)	Health, Physical Education, and Sport Studies
(520)	Home Economics
(530)	Horticulture

Table A-3 (Continued)

(532)	Human Ecology
(550)	Landscape Architecture
(559)	International Environmental Studies
(640)	Mathematics
(655)	Mechanics and Materials Sciences
(670)	Meteorology and Physical Oceanography
(705)	Nursing
(707)	Nutrition
(750)	Physics
(846)	Recreation and Leisure Services
(953)	Speech, Language, and Hearing Sciences
(960)	Statistics

Social Sciences

(010)	Accounting
(012)	Administration of Justice
(014)	African Studies
(050)	American Studies
(070)	Anthropology
(075)	Archaeology
(220)	Economics
(373)	Environmental and Business Economics
(450)	Geography
(510)	History
(512)	History: American
(571)	Journalism and Mass Media

Table A-3 (Continued)

(575)	Labor Studies
(790)	Political Science
(830)	Psychology
(836)	Puerto Rican and Hispanic Caribbean Studies
(910)	Social Work
(920)	Sociology
(975)	Urban Studies
(988)	Women's Studies

Other

(003)	Academic Foundations
(005)	Academic Studies
(090)	Arts and Sciences (college courses)
(554)	Interdisciplinary Studies (Cook College)
(556)	Interdisciplinary Studies (Faculty of Arts and Sciences)

APPENDIX B. QUESTIONNAIRES

Initial letter, accompanying Academic Questionnaire I, to Liberal Arts College C students

Office of University Undergraduate Admissions • Administrative Services Building

August 17, 1988

Dear Student,

We are cooperating with Educational Testing Service in a study of current admissions procedures for undergraduate colleges. This evaluation of admissions procedures is an important means of ensuring that they continue to be fair and effective.

Part of this research is a survey of all entering freshmen at the campus. We will appreciate your help. Please complete the enclosed questionnaire; another brief questionnaire will follow at the end of the Fall semester. The questionnaires will take only a short time to answer.

Please return the enclosed questionnaire and accompanying answer sheet (in the postage-paid envelope) directly to Educational Testing Service before the semester begins. The survey information that you provide will be kept confidential and will only be used in statistical analyses.

Thank you for your help.

Cordially,

Assistant Vice President for
University Undergraduate Admissions

Enclosure

Follow-up letter, for Academic Questionnaire I, to Liberal Arts College C students

Office of University Undergraduate Admissions • Administrative Services Building

September 9, 1988

Dear Student,

Recently we asked you to take part in a survey of entering freshmen in connection with a study of admissions procedures for our undergraduate colleges. We hope that you will participate because information that each and every student can provide is very important to the success of the study, and we hope to receive your questionnaire. Another copy of the questionnaire, as well as an answer sheet and postage-paid envelope, are enclosed for your convenience.

Again, we assure you that the survey information will be held in the strictest confidence and will only be used in statistical summaries that will not identify you in any way.

Thank you for your help.

Cordially,

Assistant Vice President for
University Undergraduate Admissions

Enclosure

P.S.

If you have already returned the questionnaire, please disregard this request.

Follow-up letter, for Academic Questionnaire I, to students in all colleges, except Liberal Arts College C

Office of University Undergraduate Admissions • Administrative Services Building

September 9, 1988

Dear Student,

We are cooperating with Educational Testing Service in a study of current admissions procedures for undergraduate colleges. This evaluation of admissions procedures is an important means of ensuring that they continue to be fair and effective.

Part of this research is a survey of all entering freshmen at the campus. We will appreciate your help. Please complete the enclosed questionnaire; another brief questionnaire will follow at the end of the Fall semester. The questionnaires will take only a short time to answer.

Please return the enclosed questionnaire and accompanying answer sheet (in the postage-paid envelope) directly to Educational Testing Service as soon as possible. The survey information that you provide will be kept confidential and will only be used in statistical analyses. .

Thank you for your help.

Cordially,

Assistant Vice President for
University Undergraduate Admissions

Enclosure

Office of University Undergraduate Admissions • Administrative Services Building

November 7, 1988

Dear Student,

We hope that you will participate in this final stage in our survey of freshmen that is being conducted to evaluate admissions procedures and to help ensure that they continue to be fair and effective. Your help is critical to the success of this study.

Please complete the brief questionnaire on the back of this letter, even if you did not receive or return the earlier questionnaire that we distributed in this survey. Then put the questionnaire in the enclosed envelope, seal it, and return it to your freshman composition instructor at the next class meeting; your questionnaire will not be seen by the instructor or anyone else at the University. The information that you provide will be kept in the strictest confidence and will only be used in statistical summaries that will not identify you in any way.

Thank you for your assistance in this important project.

Cordially,

Assistant Vice President for
University Undergraduate Admissions

Enclosure

Student Descriptive Questionnaire (SDQ)

Refer to the questions in this section, the Student Descriptive Questionnaire, to complete pages 2 and 3 of your Registration Form.

Although completing the SDQ is voluntary, it enables you to send colleges information about your interests, activities, and plans, along with your test scores. Your responses may help counselors and admissions officers to advise you about your college plans. Your answers to most questions will appear on the score reports that will be sent to you, your high school, and colleges and scholarship programs you name to receive reports. Your answers to other questions (the questionnaire identifies which ones) will *not* appear on any score reports but will be used for research and planning by educational institutions. You are encouraged to answer all questions, but you may skip any question you wish. Most of the questions are addressed to students still in high school. If you are no longer in school, answer them as well as you can.

Making Changes in Your SDQ

You need to complete this SDQ only once. If you register for a subsequent test date, you can change those answers that you want updated. However, you must answer the entire question because your new answer will completely replace your previous answer. For example, if you have taken a calculus course since the last time you answered the SDQ and want to update your SDQ by including this information, you must record all your previous math courses as well as calculus, even though you recorded these courses the first time you answered the SDQ. Your previous answers to all other questions will continue to be reported as they were to high schools and colleges.

You can make changes in your SDQ at any time by calling College Board ATP, 609-771-7600.

1. Indicate the total number of years of high school courses (in grades 9 through 12) you have taken or plan to take in each of the subjects listed below. If you have not taken any course in a subject and do not plan to take one in high school, fill in the oval in the "None" column. If you repeat a course, count it only once. If one (or more) of the courses is an advanced placement, accelerated, or honors course, fill in the oval in the "Honors" column.

   Arts and Music (for example, art, music, art history, dance, theater)
   English (for example, composition, grammar, or literature)
   Foreign and Classical Languages
   Mathematics
   Natural Sciences (for example, biology, chemistry, or physics)
   Social Sciences and History (for example, history, government, or geography)

In questions 2-5, using the same guidelines as in question 1, **indicate the total number of years you have taken or plan to take the *specific courses* listed.**

2. **Foreign and Classical Languages**

   French
   German
   Greek
   Hebrew
   Italian
   Latin
   Russian
   Spanish
   Other language courses

3. **Mathematics**

   Algebra
   Geometry
   Trigonometry
   Precalculus
   Calculus
   Computer Math
   Other mathematics courses

4. **Natural Sciences**

   Biology
   Chemistry
   Geology or related Earth or Space Sciences
   Physics
   Other science courses

5. **Social Sciences and History**

   U.S. History
   U.S. Government or Civics
   European History
   World History or Cultures
   Ancient History
   Anthropology
   Economics
   Geography
   Psychology
   Sociology
   Other social science or history courses

6. **Please enter the *average* grade for all courses** you have already taken in each subject.

   If only pass-fail grades were assigned and you received a passing grade, fill in the oval in the "Pass" column. Do not fill in a grade oval if you fill in a "Pass" oval.

   - A or excellent (usually 90-100)
   - B or good (usually 80-89)
   - C or fair (usually 70-79)
   - D or passing (usually 60-69)
   - E or F or failing (usually 59 or below)
   - Pass

   Arts and Music
   English
   Foreign and Classical Languages
   Mathematics
   Natural Sciences
   Social Sciences and History

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For questions 7 through 9, **please provide information about the content of some of your high school courses and related activities out of class.** (You may mark more than one in each subject area.)

7. **English** course work or experience
   a. American Literature
   b. British Literature
   c. Composition
   d. Grammar
   e. Literature of a country other than the United States or Britain
   f. Literature of different historical periods
   g. Speaking and listening skills
   h. English as a second language

8. **Art and Music** course work or experience
   a. I have had no course work or experience in this area.
   b. Acting or the production of a play
   c. Art history or art appreciation
   d. Dance
   e. Drama or theater for appreciation
   f. Music history, theory, or appreciation
   g. Music, instrumental or vocal performance
   h. Photography or filmmaking
   i. Studio art and design

9. **Computer** course work or experience
   a. I have had no course work or experience in this area.
   b. Computer literacy, awareness, or appreciation
   c. Data processing
   d. Computer programming (BASIC, COBOL, FORTRAN, PASCAL, etc.)
   e. Use of the computer to solve math problems
   f. Use of the computer to solve problems in the social sciences
   g. Use of the computer to solve problems in the natural sciences
   h. Use of the computer in English courses
   i. Word processing (use of the computer in writing letters or preparing papers)

10. **Please indicate your cumulative grade point average** for all academic subjects in high school.
   - A+ (97-100)
   - A (93-96)
   - A− (90-92)
   - B+ (87-89)
   - B (83-86)
   - B− (80-82)
   - C+ (77-79)
   - C (73-76)
   - C− (70-72)
   - D+ (67-69)
   - D (65-66)
   - E or F (below 65)

11. **What is your most recent high school class rank?** (For example, if you are 15th in a class of 100, you are in the second tenth.) If you do not know your rank, please check with your high school guidance counselor. If rank is not used in your school, give your best estimate.
   a. Highest tenth } in the
   b. Second tenth } top fifth
   c. Second fifth
   d. Middle fifth
   e. Fourth fifth
   f. Lowest fifth

12. In addition to regular class work, many students are involved in activities that reflect their abilities and interests. These include community service and involvement, extracurricular and out-of-school activities, and individual endeavors. **Indicate in which grades you participated or will participate in the activities listed below.**

    If you held a major office or position of leadership in an activity (for example, class president, varsity team captain, officer of a statewide organization), fill in the oval in the "Officer" column. Remember to include activities and accomplishments that are not school sponsored as well as your extracurricular activities.

    If you have received an award or special recognition for achievement in an activity (for example, school prize for music or writing, varsity letter, regional science fair prize, state orchestra), fill in the oval in the column marked "Award."
   - Academic honor society
   - Art activity
   - Athletics: Intramural, junior varsity, or community sports
   - Athletics: Varsity or amateur-level sports
   - Career-oriented activity (for example, Future Teachers of America, Future Farmers of America, Future Homemakers)
   - Community or service activity (for example, volunteer work, neighborhood clean-up or patrol group, Scouting, 4-H, Key Club)
   - Computer activity (for example, a user's group, computer club, learning to use a computer on your own)
   - Dance activity
   - Debating or public speaking
   - Ethnic or cross-cultural activity (for example, Black student organization, Hispanic club, international folk dancing)
   - Foreign exchange or study abroad program
   - Foreign language activity
   - Government or political activity (for example, student government, honors council, working on a political campaign, human rights or civil rights activity in your community)
   - Journalism or literary activity (for example, creative writing, yearbook, school newspaper, community newspaper)
   - Junior Reserve Officers Training Corps
   - Music: Instrumental (for example, high school band, community orchestra, solo work)
   - Music: Vocal (for example, glee club, chorus, solo work)
   - Religious activity or organization
   - Science or mathematics activity (for example, math club, ecology or environmental group, science fair project)
   - School-spirit activity (for example, cheerleading, drill team)
   - Theater activity (for example, community or school production, acting, stage crew)
   - Work: Cooperative work program
   - Work: Part-time job, not school related
   - Other activity not listed
   - I have not participated in any of the above activities.

13. **Please indicate the sports in which you have participated.** (You may mark up to six sports.)
   - I have not participated in any sports.

   a. Archery
   b. Badminton
   c. Baseball
   d. Basketball
   e. Bowling
   f. Boxing
   g. Cross-country
   h. Diving
   i. Fencing
   j. Field hockey
   k. Football
   l. Golf
   m. Gymnastics
   n. Handball
   o. Horseback riding
   p. Ice hockey
   q. Lacrosse
   r. Paddleball
   s. Racquetball
   t. Riflery
   u. Rowing (crew)
   v. Rugby
   w. Sailing
   x. Skiing
   y. Skin diving
   z. Soccer
   0. Softball
   1. Squash
   2. Swimming
   3. Table tennis
   4. Tennis
   5. Track and field
   6. Volleyball
   7. Water polo
   8. Wrestling
   9 Other

Questions 14 through 19 ask about the kind of college or university you are interested in attending during your first year in college. There are no "right" or "wrong" answers, and you may mark as many preferences as you like. If you do not have an idea about the kind of college or university you'd like to attend, fill in the last oval, "Undecided."

14. **What type(s) of institution are you interested in attending?** (You may mark more than one.)
    a. A four-year college or university
    b. A two-year community or junior college
    c. A vocational/technical school
    d. Undecided

15. **Which of the following are you considering?** (You may mark more than one.)
    a. A public university, state college, or community college
    b. A private university, college, or junior college (not religiously affiliated)
    c. A private, religiously affiliated university, college, or junior college
    d. Undecided

16. **What size college(s) are you thinking of attending?** (You may mark more than one.)
    a. Less than 1,000 students
    b. About 1,000 to 5,000 students
    c. About 5,000 to 10,000 students
    d. About 10,000 to 20,000 students
    e. More than 20,000 students
    f. Undecided

17. **What college setting(s) do you prefer?** (You may mark more than one.)
    a. Large city or metropolitan area
    b. Medium-size city
    c. Small city or town
    d. Suburban community
    e. Rural
    f. Undecided

18. **Where would you like to go to college?** (You may mark more than one.)
    a. Close to home
    b. In my home state
    c. In a state bordering mine
    d. Beyond states bordering mine
    e. Outside the United States
    f. Undecided

19. **What type(s) of college are you considering?** (You may mark more than one.)
    a. All women or all men
    b. Coeducational
    c. Undecided

20. **What is the highest level of education you plan to complete beyond high school?** (Mark only one.)
    a. Specialized training or certificate program
    b. Two-year associate of arts or sciences degree (such as AA, AAS, or AS)
    c. Bachelor's degree (such as BA or BS)
    d. Master's degree (such as MA, MBA, or MS)
    e. Doctoral or related degree (such as PhD, JD, MD, DVM)
    f. Other
    g. Undecided

A list of both general (bold type) and specific majors or areas of study in college is on page 15. Related areas or majors are indicated in parentheses. Although you do not need to know what your "major" in college will be, we would like you to mark the subject area or areas that interest you. In questions 21, 23, 24, 25, and 26 you may indicate the specific or general areas of study that you are considering. *If you have none,* please fill in number 999 (Undecided).

21. **Indicate the major or area of study that is your first choice.** Write in the code number and fill in the appropriate oval under each digit.

22. **How certain are you about your first choice of major or area of study?**
    - Very certain
    - Fairly certain
    - Not certain

23–26. **Indicate up to four other majors or areas of study that interest you.**

27. The College Board sponsors various services and publications to help students and their families plan for college. Occasionally, we may want to notify you of these opportunities. **Would you and your family like to receive announcements about these services and publications?**
    - Yes
    - No

28. **Is your parent's address the same as your mailing address on this Registration Form?**
    - Yes
    - No

29. Some colleges allow well-prepared students to skip required introductory courses and take advanced course work instead. This exemption is sometimes based upon the results of tests such as Advanced Placement Examinations, Achievement Tests, and tests of the College-Level Examination Program. Some colleges give their own placement or "credit by examination" tests. **Mark each subject area in which you plan to apply for advanced placement, credit by examination, or exemption from courses.**
    a. Art
    b. Biology
    c. Chemistry
    d. Computer Science
    e. English
    f. Foreign Languages
    g. Humanities
    h. Mathematics
    i. Music
    j. Physics
    k. Social Studies
    l. I don't plan to apply for exemption from these courses.

30. You may want to receive help outside regular course work from the college you plan to attend. If so, **indicate each area in which you may want help.**
    a. Developing educational plans
    b. Developing vocational/career or placement plans
    c. Developing better study skills
    d. Improving mathematical skills
    e. Improving reading skills
    f. Improving writing skills
    g. I don't plan to ask for help in these areas.

31. Below is a list of typical activities or clubs in which students participate in college. **Mark each activity you may want to take part in while in college.**
    a. Art
    b. Athletics: Intramural sports
    c. Athletics: Varsity sports
    d. Community or service organization
    e. Cooperative work or internship program
    f. Dance
    g. Debating or public speaking
    h. Departmental organization (club within my major)
    i. Drama or theater
    j. Environmental or ecology activity
    k. Ethnic activity
    l. Foreign study or study abroad program

(list continues on next page)

m. Fraternity, sorority, or social club
n. Honors program or independent study
o. Journalism or literary activity
p. Music: Instrumental performance
q. Music: Vocal performance
r. Religious activity
s. Reserve Officers Training Corps (ROTC, AFROTC, or NROTC)
t. Student government

32. **Do you plan to apply for financial aid at any college?**

- Yes
- No
- I don't know.

33. **Do you plan to look for a part-time job while in college?**

- Yes
- No
- I don't know.

34. **Where do you plan to live during your first year in college?**

a. At home
b. On-campus housing
c. Off-campus housing
d. I don't know.

The College Board wants its tests and services to be fair and useful to all candidates. Research based on responses to questions 35 through 37 will help the College Board evaluate and improve its tests and services. Your responses will also be reported to the colleges you specify that accept such information.

35. **How do you describe yourself?** (Mark only one.)

a. American Indian or Alaskan native
b. Asian, Asian American, or Pacific Islander
c. Black or African American

Hispanic background:

d. Mexican American or Chicano
e. Puerto Rican
f. Latin American, South American, Central American, or other Hispanic

g. White
h. Other

36. **What language did you learn to speak first?**

a. English only
b. English and another language
c. Another language

37. **What is your citizenship status?**

a. U.S. citizen
b. Alien, refugee, or permanent resident of the U.S.
c. Citizen of another country

38. Colleges are often interested in contacting prospective students about their campus-based religious clubs and offerings. **Please write in the number of your religious preference or affiliation** and fill in the appropriate oval below each digit. If your religious preference or affiliation is not listed, please fill in number 97, "Other."

01 I prefer not to answer.
03 African Methodist Episcopal
05 Anglican
07 Assembly of God
09 Baptist
11 Southern Baptist Convention
13 Buddhism
15 Christian Church (Disciples of Christ)
17 Christian Reformed Church in America
19 Church of the Brethren
21 Church of Christ
23 United Church of Christ
25 Church of Christ, Scientist (Christian Science)
27 Church of God
29 Church of Jesus Christ of Latter-day Saints
31 Church of the Nazarene
33 Episcopal
35 Hinduism
37 Islam
39 Judaism
41 Lutheran Church in America
43 Lutheran Church—Missouri Synod
45 Mennonite
47 Methodist
49 United Methodist
51 Orthodox Eastern churches
53 Pentecostal
55 Presbyterian Church (U.S.A.)
57 Roman Catholic
59 Seventh-day Adventists
61 Society of Friends (Quaker)
63 Unitarian Universalist Association
65 Wesleyan Church
97 Other
99 No preference or affiliation

Your answers to questions 39 through 42 will *not* be included on your score report or on the reports sent to your high school or any colleges. Your answers to these questions may be used for research purposes or reports about groups of students, but only in ways that ensure your privacy.

39. **Please indicate any permanently disabling condition you have.**

a. None
b. Blindness or other noncorrectable visual impairment
c. Deafness or other hearing impairment
d. Paraplegia
e. Learning disability
f. Other neurological or orthopedic impairment
g. Multiple disabilities
h. Other
i. I prefer not to answer.

40. **How do you think you compare with other people your own age in the following three areas of ability?** For each area, fill in the appropriate response.

- Among the highest 10 percent in this area of ability
- Above average in this area
- Average in this area
- Below average in this area

Mathematical ability
Scientific ability
Writing ability

41. **Indicate the highest level of education completed by your father** (or male guardian) **and your mother** (or female guardian) by filling in the appropriate oval in each column. (Mark only one.)

a. Grade school
b. Some high school
c. High school diploma or equivalent
d. Business or trade school
e. Some college
f. Associate or two-year degree
g. Bachelor's or four-year degree
h. Some graduate or professional school
i. Graduate or professional degree

42. **What was the approximate combined income of your parents before taxes last year?** Include taxable and nontaxable income from all sources.

a. Less than $10,000
b. About $10,000 to $15,000
c. About $15,000 to $20,000
d. About $20,000 to $25,000
e. About $25,000 to $30,000
f. About $30,000 to $35,000
g. About $35,000 to $40,000
h. About $40,000 to $50,000
i. About $50,000 to $60,000
j. About $60,000 to $70,000
k. More than $70,000

College Majors by Academic Area of Study

100 Agriculture and Natural Resources
101 Agriculture business
102 Agriculture economics
103 Agriculture and farm management (farming and ranching)
104 Agriculture, forestry, and wildlife technologies
105 Agronomy (field crops and crop management)
106 Animal sciences
107 Conservation
108 Dairy science
109 Equestrian science
110 Fish and wildlife management
111 Food science
112 Forestry
113 Horticulture
114 Natural resources management
115 Ornamental horticulture
116 Preveterinary or veterinary medicine
117 Poultry science
118 Soils sciences

130 Architecture and Environmental Design
131 Architecture
132 Architectural technology
133 City, community, and regional planning and development (*also see* Public Affairs and Services)
134 Environmental design
135 Interior design
136 Landscape architecture
137 Urban design

140 Arts: Visual and Performing (*also see* Education)
141 Applied design (ceramics, weaving, textile design, fashion design, jewelry, metalsmithing, interior decoration, commercial art)
142 Art (painting, drawing, sculpture)
143 Art history and appreciation
144 Cinematography/Film
145 Dance
146 Dramatic arts
147 Graphic arts and industrial design
148 Instrumental music (performance)
149 Music (composition, theory)
150 Music history and appreciation
151 Photography
152 Vocal music (performance)

170 Biological (Life) Sciences (*also see* Science Education *in* Education)
171 Anatomy
172 Bacteriology
173 Biochemistry
174 Biology
175 Biometrics and biostatistics
176 Biophysics
177 Botany
178 Cell biology (cytology, cell physiology)
179 Ecology and environmental science (*also see* Agriculture and Natural Resources)
180 Embryology
181 Entomology
182 Genetics
183 Histology
184 Marine biology
185 Microbiology
186 Molecular biology
187 Neurosciences
188 Nutritional sciences (*also see* Home Economics)
189 Pathology, human and animal
190 Pharmacology, human and animal
191 Physiology, human and animal
192 Plant pathology (*also see* Agriculture and Natural Resources)
193 Plant pharmacology (*also see* Agriculture and Natural Resources)
194 Plant physiology (*also see* Agriculture and Natural Resources)
195 Radiobiology
196 Toxicology
197 Zoology

200 Business and Commerce (*also see* Education)
201 Accounting
202 Advertising (*also see* Communications)
203 Banking and finance
204 Business economics (*also see* Economics in Social Sciences and History)
205 Business management and administration
206 Business statistics
207 Fashion merchandising
208 Hotel/motel and restaurant management (*also see* Home Economics)
209 Insurance and risk management
210 International business
211 Investments and securities
212 Labor and industrial relations
213 Management information systems (*also see* Computer and Information Sciences and Technologies)
214 Marketing
215 Operations research
216 Personnel management
217 Real estate
218 Recreation, tourism, and travel
219 Transportation and commerce

230 Communications (*also see* Language and Literature *and* Business and Commerce)
251 Advertising
252 Business and technical writing
253 Film
254 Journalism (printed media)
255 Public relations
256 Radio and television (broadcasting)

300 Computer and Information Sciences and Technologies (*also see* Engineering)
301 Computer programming
302 Computer science
303 Data processing
304 Data systems repair
305 Information systems and sciences
306 Microcomputer software
307 Systems analysis

308 Education
351 Adult and continuing education
352 Agricultural education (*also see* Agriculture and Natural Resources)
353 Art education (*also see* Arts: Visual and Performing)
354 Bilingual and bicultural education
355 Business education (*also see* Business and Commerce)
356 Child development and nursery education (*also see* Home Economics *and* Social Sciences and History)
357 Curriculum and instruction
358 Driver and safety education
359 Education of the culturally disadvantaged
360 Education of the deaf and hearing impaired
361 Education of the emotionally handicapped
362 Education of exceptional children
363 Education of the gifted and talented
364 Education of the mentally handicapped
365 Education of the physically handicapped
366 Education of the visually handicapped
367 Educational administration
368 Educational statistics and research
369 Educational testing, evaluation, and measurement
370 Elementary education
371 English education (*also see* Language and Literature)
372 Health education (*also see* Health Professions and Allied Services)
373 Higher education
374 Home economics education (*also see* Home Economics)
375 Industrial arts, vocational/technical education
376 Mathematics education (*also see* Mathematics)
377 Marketing and distributive education (*also see* Business and Commerce)
378 Music education (*also see* Arts: Visual and Performing)
379 Pre-elementary education (kindergarten) (*also see* Social Sciences and History *and* Home Economics)
380 Physical education
381 Reading education (methodology and theory)
382 School psychology (*also see* Social Sciences and History)
383 Science education (*also see* Biological Sciences *and* Physical Sciences)
384 Secondary education
385 Social science education (*also see* Social Sciences and History)
386 Special education
387 Specific learning disabilities
388 Speech and hearing education, therapy
389 Student counseling and personnel services
390 Teaching of English as a foreign language

400 Engineering and Engineering Technologies
401 Aerospace, aeronautical, and astronautical engineering
402 Agricultural engineering (*also see* Agriculture and Natural Resources)
403 Architectural engineering (*also see* Architecture and Environmental Design)
404 Bioengineering and biomedical engineering
405 Ceramic engineering
406 Chemical engineering
407 Civil construction, and transportation engineering
408 Computer engineering (*also see* Computer and Information Sciences and Technologies)
409 Electrical engineering
410 Engineering and public policy
411 Engineering mechanics
412 Engineering physics
413 Engineering sciences
414 Environmental health engineering
415 Geological engineering
416 Geophysical engineering
417 Industrial engineering
418 Industrial laboratory technology
419 Instrumentation technology
420 Materials engineering
421 Mechanical engineering
422 Mechanical engineering technologies
423 Metallurgical engineering
424 Mining and mineral engineering
425 Naval architecture and marine engineering
426 Nuclear engineering
427 Nuclear technology
428 Ocean engineering
429 Petroleum engineering
430 Plastics technology
431 Surveying and mapping sciences

450 Foreign Languages and Classical Languages
451 African languages (non-Semitic)
452 Arabic
453 Classical languages, general
454 Chinese
455 Foreign languages, multiple emphasis (includes concentration in more than one foreign language without major emphasis in any one language)
456 French
457 German
458 Greek, classical
459 Greek, modern
460 Hebrew
461 Indic languages (including Hindi and Sanskrit)
462 Italian
463 Japanese
464 Korean
465 Latin
466 Modern languages, general
467 Native American languages
468 Portuguese
469 Russian
470 Scandinavian languages
471 Slavic languages (other than Russian)
472 Spanish

480 General and Interdisciplinary Studies
481 General liberal arts and sciences
482 General studies
483 Biological and physical sciences
484 Engineering and other disciplines
485 Humanities and social sciences
486 Women's studies

500 Health Professions and Allied Services
501 Chiropractic (DC or DCM degree)
502 Dental hygiene or assistance
503 Dental laboratory technology
504 Emergency/disaster sciences or technology
505 Environmental health
506 Hospital and health care administration
507 Medical assistant or medical office assistant technologies
508 Medical laboratory technologies
509 Medical records technology and administration
510 Medical social work (medical and psychiatric and specialized rehabilitation services) (*also see* Public Affairs and Services)
511 Nuclear medicine and technologies
512 Nurse anesthetist
513 Nursing
514 Occupational therapy
515 Optometry
516 Osteopathic medicine (DO degree)
517 Pharmacy
518 Physical therapy
519 Physician's assistant
520 Podiatry or podiatric medicine (Pod. D or DP degree)
521 Predentistry - Dentistry (DDS or DMD degree)
522 Premedical - Medical (MD)
523 Preveterinary medicine - Veterinary medicine (DVM degree) (*also see* Agriculture and Natural Resources)
524 Public health
525 Radiologic technologies
526 Radiology and X-ray technology
527 Recreation therapy
528 Speech pathology and audiology (*also see* Education)
529 Sports medicine
530 Surgical technology

600 Home Economics (*also see* Education *and* Business and Commerce)
601 Child development, care and guidance
602 Clothing and textiles
603 Consumer studies
604 Family relations
605 Foods and nutrition (includes dietetics) (*also see* Agriculture and Natural Resources)
606 Home decoration and home equipment (*also see* Architecture and Environmental Design)
607 Institutional management

620 Language and Literature (*also see* Education)
621 American literature
622 Classics
623 Comparative literature
624 Creative writing
625 English
626 English literature
627 Linguistics (includes phonetics, semantics, and philology)
628 Speech, debate, forensic science (includes rhetoric and public address)

640 Library and Archival Sciences
641 Archival science
642 Library assistant
643 Library science
644 Museum studies

650 Mathematics (*also see* Education)
651 Actuarial sciences (*also see* Business and Commerce)
652 Applied mathematics
653 Mathematical and theoretical statistics

670 Military Sciences
671 Aerospace science (Air Force)
672 Coast Guard science
673 Merchant Marine science
674 Military science (Army)
675 Naval science (Navy, Marines)

680 Philosophy, Religion, and Theology
691 Philosophy
692 Religious education
693 Religious studies
694 Theology and theological professions

700 Physical Sciences
701 Analytical chemistry
702 Astronomy
703 Astrophysics
704 Atmospheric sciences and meteorology
705 Chemistry, general
706 Earth science
707 Geochemistry
708 Geology
709 Geophysics and seismology
710 Inorganic chemistry
711 Metallurgy
712 Molecular physics
713 Nuclear physics
714 Oceanography
715 Organic chemistry
716 Paleontology
717 Planetary science
718 Pharmaceutical chemistry
719 Physical chemistry
720 Physics, general

800 Public Affairs and Services
801 City, community, and regional planning and development (*also see* Architecture and Environmental Design)
802 Community services, general
803 Criminal justice
804 Fire science or protection
805 Funeral services
806 International public service (including foreign service)
807 Law enforcement and corrections
808 Parks and recreation management
809 Public administration
810 Safety administration
811 Social work

850 Social Sciences and History, General (*also see* Public Affairs and Services *and* Education)
851 American history
852 Anthropology
853 Archaeology
854 Child psychology
855 Clinical psychology
856 Criminology
857 Demography
858 Economics (*also see* Business and Commerce)
859 European history
860 Experimental psychology
861 Geography
862 History, general
863 Industrial psychology
864 International relations
865 Political science or government
866 Prelaw - Law (JD degree)
867 Psychology
868 Social psychology
869 Sociology
870 Area and ethnic studies
871 African studies
872 American studies
873 American Indian studies
874 Asian studies
875 Black studies
876 Hispanic American studies
877 Islamic studies
878 Jewish studies
879 Latin American studies
880 Mexican American studies
881 Middle Eastern studies
882 Pacific area studies
883 Russian and Slavic studies
884 Spanish American studies

900 Technical and Vocational
951 Air transportation technologies
952 Flight attendant
953 Automotive mechanics
954 Aircraft mechanics
955 Construction trades
956 Carpentry and woodworking
957 Cosmetology
958 Culinary arts
959 Drafting/engineering graphics
960 Electronics
961 Heating, air conditioning, and refrigeration
962 Machine tool technology
963 Masonry (brick, cement, stone, etc.)
964 Plumbing, pipefitting, steamfitting
965 Precision metalwork
966 Secretarial studies

999 Undecided

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ACADEMIC QUESTIONNAIRE I

Directions

This questionnaire contains a series of statements about academic matters. Read each statement and decide how you feel about it. Then indicate your answer on the separate answer sheet. If you agree with a statement or feel that it is true about you , mark an A on the answer sheet. If you disagree with a statement or feel that it is not true about you, mark a B on the answer sheet. Answer every statement, even if you are not completely sure of your answer.

Mark the answers on the answer sheet, using a soft black lead pencil (No. 2). Be sure each mark is dark and completely fills the oval answer space. Do not make stray marks on the answer sheet. If you erase, do so completely. The answer sheet has spaces for more answers than there are statements in the questionnaire; mark only the spaces that correspond to the statements.

On the side of the answer sheet for identifying information:

1. Print as much as possible of your last name, first name, and middle initial (MI) in the boxes provided--one letter to a box. Then fill in the corresponding oval under each letter.

2. Print your Social Security number in the boxes labeled G. Use the first nine boxes. Then fill in the corresponding oval under each number.

3. Print your sex (M for Male, F for Female) in the box labeled E. Then fill in the corresponding oval (1 for Male, 2 for Female) under the box.

4. Print the numbers for the month, day, and year of your birth in the boxes labeled F. Be sure to add a zero before any single digit month or day. For example, July 4, 1970 should be entered as 070470. Then fill in the corresponding oval under each number.

5. Do not fill in any other information on this side of the answer sheet.

After you have filled in the identifying information, begin the questionnaire and record your answers on the other side of the answer sheet.

ETS Project,
ETS Mail Stop 16-R

A--AGREE OR TRUE B--DISAGREE OR NOT TRUE

1. If I really wanted to, I could learn enough history to be a history minor in college.
2. While I may (or may not) be nervous before taking an exam, once I start, I seem to forget to be nervous.
3. I can get good grades in mathematics.
4. When I start a test, nothing is able to distract me.
5. Nervousness while taking a test helps me do better.
6. My lecture notes are usually easy to decipher afterwards.
7. I usually plan my week's school work in advance, either on paper or in my head.
8. Often my poorer grades are obtained in courses that the teacher has failed to make interesting.
9. I feel that some of my good grades depend to a considerable extent on chance factors, such as having the right questions show up on an exam.
10. The most important ingredient in getting good grades is my academic ability.
11. In courses in which the total grade is based mainly on *one* exam, I seem to do better than other people.
12. If I were to receive low marks it would cause me to question my academic ability.
13. Mathematics is easier for me than it is for most people.
14. I look forward to exams.
15. I am not very good at working mathematics problems.
16. Sometimes I feel that I have to consider myself lucky for the good grades I get.
17. When I am poorly prepared for an exam or test, I get upset, and do less well than even my restricted knowledge should allow.
18. I am usually at ease in history class.
19. Time pressure on an exam causes me to do worse than the rest of the group under similar conditions.
20. I am no good in mathematics.
21. Poor grades inform me that I haven't worked hard enough.
22. I cannot see how mathematics will be very useful to me outside of school.
23. I have a lot of self-confidence when it comes to studying English.
24. I am confident in mathematics.
25. I find myself reading exam questions without understanding them, and I must go back over them so that they will make sense.
26. I just cannot understand mathematics.
27. Knowing mathematics will help me get a good job.
28. My handwriting is clear.
29. The more important the examination, the less well I seem to do.
30. In a course where I have been doing poorly, my fear of a bad grade cuts down my efficiency.
31. I'm not the type to do well in English.
32. I try hard to make my handwriting legible.
33. History is one of the hardest subjects I have taken.
34. I need to be in the right mood before I can study effectively.
35. I find it difficult to keep awake during some lectures.
36. Background music makes it hard for me to study effectively.
37. During exams or tests, I block on questions to which I know the answers, even though I might remember them as soon as the exam is over.
38. I'm rather slow at starting school work in the evenings.
39. For some reason even though I study, English seems unusually hard for me.
40. Most subjects I can handle O.K., but I have a knack of flubbing English.
41. Some of the times that I have gotten a good grade in a course it was due to the teacher's easy grading.
42. My habit of putting off work leaves me with far too much to do at the end of the term.

GO ON TO NEXT PAGE

A--AGREE OR TRUE B--DISAGREE OR NOT TRUE

43. I don't feel self-assured during science tests.

44. I find that my mind goes blank at the beginning of an exam, and it takes me a few minutes before I can function.

45. Some of my lower grades have seemed to be partially due to bad breaks.

46. I usually feel confident when taking mathematics tests.

47. My high school teachers criticized my handwriting.

48. I probably will not need mathematics in my future work.

49. I don't think I could do well in a college course in history.

50. In the science classes I have taken, I haven't felt confident when I was called on.

51. I seem to have little free time during the week.

52. Although "cramming" under pre-examination tension is not effective for most people, I find that if the need arises, I can learn material immediately before an exam, even under considerable pressure, and successfully retain it to use on the exam.

53. I can do history assignments without help from anyone.

54. English has been my best subject.

55. Sometimes I get good grades only because the course material was easy to learn.

56. Knowing mathematics will help me better understand the world about me.

57 If I were to get poor grades I would assume that I lacked ability to succeed in those courses.

58. Generally I have felt secure about attempting science.

59. I think I could handle more difficult courses in English.

60. I can overcome all obstacles in the path of academic success if I work hard enough.

61. I enjoy taking a difficult exam more than an easy one.

62. Mathematics is useful in my daily life.

63. I am so tired from worrying about an exam that I find I almost don't care how well I do by the time I start the test.

64. I work most effectively under pressure, as when the task is very important.

65. Most of my classmates in high school had better handwriting than mine.

66. I am sure I could do advanced work in science.

67. The more important the exam or test, the better I seem to do.

68. Sometimes I feel that I just can't learn history.

69. Mathematics is important to my future educational plans.

70. Science is a difficult subject.

71. Nervousness while taking an exam or test hinders me from doing well.

72. I find enough time to study during the holidays.

73. In my experience, once a teacher gets the idea you're a poor student your work is much more likely to receive poor grades than if someone else handed it in.

74. I rarely have difficulty reading my own handwriting.

75. Anyone can learn science.

76. People have trouble reading my handwriting.

77. When I fail to do as well as expected in school it is often due to a lack of effort on my part.

78. I am very proud of my mathematics school work.

79. It's rather difficult for me to organize my study time.

80. Some of my bad grades may have been a function of bad luck, being in the wrong course at the wrong time.

81. I find it difficult to pick out the relevant points in a lecture unless they are written on the board or in a handout.

82. When I don't do well on a difficult item at the beginning of an exam, it tends to upset me so that I block on even easy questions later on.

ACADEMIC QUESTIONNAIRE II

NAME Enter your full name, including your middle initial if you have one. Omit spaces, hyphens, apostrophes, and Jr. or III.

Last Name(Family Name) -- first 15 letters	First Name -- first 12 letters	MI	SOCIAL SECURITY NUMBER

Please list all the courses with three credits or more that you are taking this semester.

Course	Subject	Course Number or Title
#1		
#2		
#3		
#4		
#5		
#6		

Now, please answer the following questions about <u>each</u> of these courses.

	Course: #1	#2	#3	#4	#5	#6
What kind of notes do you usually take in regular class meetings for this course: (A) detailed notes, main points, or outlines; or (B) scattered notes or none at all? **A or B:**						
About how many hours per week do you usually spend studying or doing assignments outside of class for this course? **Number:**						
About what percentage of the required reading for this course that was supposed to be completed by now have you done? **Percentage**(0% to 100%):						
About what percentage of required assignments that were due so far in this course have you handed in on time? **Percentage**(0% to 100%):						
About what percentage of the tests or quizzes so far this course have you taken when they were scheduled? (If there were no tests or quizzes, write NO.) **Percentage**(0% to 100%):						
About what percentage of regular class meetings (not recitation or laboratory section meetings) have you missed for any reason so far in this course? **Percentage**(0% to 100%):						
About what percentage of recitation section meetings have you missed for any reason so far in this course? (If there were no recitation sections, write NO.) **Percentage**(0% to 100%):		58				